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APPENDIX TO THE JOURNALS

OF THE

SENATE AND ASSEMBLY

OF THE

FORTY-FOURTH SESSION

OF THE

LEGISLATURE OF THE STATE OF CALIFORNIA

VOLUME V



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO.

APPENDIX TO THE JOURNALS

OF THE

SENATE AND ASSEMBLY

OF THE

FORTY-FOURTH SESSION

OF THE

LEGISLATURE OF CALIFORNIA

*328.794 2
C12:44

192916

VOLUME 1



PRINTED BY THE STATE PRINTER
SACRAMENTO, CALIF., 1900

VOLUME V.

- 1—Report of State Mineralogist, 1915-1916.
- 2—Preliminary Report No. 6, State Mineralogist, 1919.
- 3—Report of Commission of Immigration and Housing, 1920.
- 4—Report of Department of Weights and Measures, 1919-1920.
- 5—Report of Purchasing Department, 1918-1920.
- 6—Report of Stallion Registration Board, 1919.
- 7—Report of Stallion Registration Board, 1920.
- 8—Report of Bureau of Criminal Identification and Investigation, 1920.
- 9—Report of Veterans' Home, 1919.
- 10—Report of Veterans' Home, 1920.
- 11—Report of California School for Girls, 1918-1920.
- 12—Report of Reclamation Board, 1919-1920.
- 13—Report of Superintendent of State Printing, 1919-1920.
- 14—Report of Department of Engineering, 1919-1920.
- 15—Report of Civil Service Commission.
- 16—Report of Board of State Harbor Commissioners, 1918-1920.

CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

FLETCHER HAMILTON

State Mineralogist

San Francisco]

[December, 1917

REPORT XV

OF THE

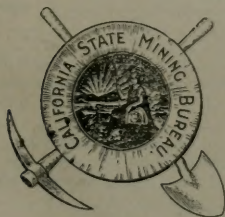
STATE MINERALOGIST

Mines and Mineral Resources

OF PORTIONS OF

CALIFORNIA

Chapters of State Mineralogist's Report
Biennial Period 1915-1916



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1919

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ADMINISTRATIVE STATEMENT.

The general survey of the mineral resources of California, which was inaugurated during the sixty-fourth and sixty-fifth fiscal years, was vigorously prosecuted during the sixty-sixth and sixty-seventh, the results of this effort being included in the volume presented herewith.

With but few exceptions, detailed data relative to the mines, quarries, and oil wells of every county in the state are now available for the information of the general public, in no matter what phase of the industry they may be interested.

It will be noted that an attempt has been made to also convey helpful advice to the prospector, particularly as regards the counties containing vast stretches of desert and arid regions where climatic conditions are unfavorable, and where it is often a matter of life and death to secure water and food, and sometimes fuel and other supplies.

In addition to the work, the result of which is made available through the medium of this volume, the activities of the Bureau have been broadened to an extent never before undertaken, and it is believed that the ends attained have fully justified the time and money expended.

War demands for practically every mineral produced in the state have been responsible for unwonted activity in mining, and as a result the inquiries, both personal and written, which have been daily received and answered, make up a volume of labor which does not appear in the printed records, but which consumes a large proportion of the time of the State Mineralogist, as well as that of his staff.

Publications.

As a means of meeting new and special demands, as well as of forwarding the general development of the mineral resources of California, it is a pleasure to report the following finished work which has been accomplished, aside from the material contained in this report:

Bulletin No. 69, on the "Petroleum Industry of California," mentioned in the biennial report of 1913-1914 as being in preparation, was issued in October, 1914. It covers the subject of our crude oil resources very thoroughly, and is accompanied by a folio of eighteen areal, structural, and geological maps.

Bulletins Nos. 70 and 71, annual statistical reports for the calendar years 1914 and 1915, respectively, show the mineral production of California for those periods. This annual bulletin has been enlarged and improved in every respect, and in addition to the mere figures of

output there have been included descriptions of the uses and characteristics of many of the mineral substances found in this state, as well as a brief mention of their occurrence.

Geologic Map of California, lithographed in 17 colors, which makes available for reference for the first time a detailed record of the geology of every portion of the entire state. Accompanying this map has been issued Bulletin No. 72, entitled "Geologic Formations of California."

Following the above, Bulletin No. 73 was issued for free distribution, entitled "First Annual Report of the State Oil and Gas Supervisor of California." This report contains 278 pages and 26 illustrations, outlines the work and policy of the Department of Petroleum and Gas, describes in detail causes of damage to oil wells by infiltrating water, contains typical geological cross-sections and other technical matter, oil well logs, etc., for the information and guidance of the operator in the field. This report also shows the production of petroleum in California, the area of proved oil lands, contains a review of work in the various fields which was completed during 1915 and 1916, describes practical methods of shutting off water, contains data on strength of casing, and cause for failure of derricks, describes the manufacture of gasoline from natural gas, and includes a directory of oil companies, showing date of incorporation, capital stock, number of wells and location of property.

Mineral Production of California.

As a means of briefly indicating the immense forward strides which mining has recently taken here, the following tables have been included, showing the comparative yield of mineral substances of California for the calendar years 1914 and 1915, as compiled from the returns received at the State Mining Bureau in answer to inquiries sent to producers:

The following table shows the values of the several minerals produced in California during the calendar years 1914 and 1915:

Substance	1914	1915
Antimony ore		\$35,666
Asbestos	\$1,530	2,860
Barytes	3,000	620
Bituminous rock	166,618	61,468
Borax	1,483,500	1,663,521
Brick	2,288,227	1,678,756
Cement	6,558,148	6,044,950
Chromite	9,434	38,044
Clay (pottery)	167,552	133,724
Coal	28,806	26,662
Copper	4,055,375	7,169,567
Dolomite		14,504
Feldspar	16,565	9,000
Fuller's earth	5,928	4,002
Gems	3,970	3,565
Gold	20,653,496	22,442,296
Gypsum	78,375	48,953
Infusorial earth	80,350	62,000
Iron ore	5,128	2,584
Lead	183,198	225,426
Lime	378,663	286,304
Limestone	517,713	156,288
Lithia		1,365
Magnesite	114,380	283,461
Manganese ore	1,500	49,098
Marble	48,832	41,518
Mineral paint	847	1,756
Mineral water	476,169	467,738
Natural gas	1,049,470	1,706,480
Petroleum	47,487,109	43,503,837
Platinum	14,816	21,149
Potash	460	19,391
Pumice	1,000	6,400
Pyrite	230,058	293,148
Quicksilver	557,846	1,157,449
Salt	583,553	368,737
Sandstone	45,322	8,438
Silica (sand and quartz)	22,688	34,322
Silver	813,938	851,129
Slate		5,000
Soapstone and talc	4,500	14,750
Soda	115,396	83,485
Stone, miscellaneous	4,860,357	5,011,106
Tungsten concentrates	180,575	1,005,467
Zinc	20,381	1,617,383
Totals	\$93,314,773	\$96,663,369

The following table shows the value of the mineral production of the various counties in the state for the calendar years 1914 and 1915:

County	1914	1915
Alameda	\$870,427	\$861,683
Alpine		
Amador	3,211,109	4,063,762
Butte	1,755,782	1,622,245
Calaveras	2,005,954	2,161,893
Colusa	32,251	16,003
Contra Costa	1,149,321	1,309,505
Del Norte	5,938	4,524
El Dorado	149,226	428,336
Fresno	7,484,473	8,152,300
Glenn	30,553	46,667
Humboldt	233,332	358,686
Imperial	250,529	77,433
Inyo	2,085,112	2,771,042
Kern	28,040,296	25,335,184
Kings	740	18,608
Lake	63,503	72,534
Lassen	4,568	870
Los Angeles	4,665,504	4,168,612
Madera	203,009	145,063
Marin	554,137	160,528
Mariposa	187,505	412,326
Mendocino	560	24,536
Merced	¹ 111,701	94,032
Modoc	1,252	8,681
Mono	16,060	109,425
Monterey	114,254	84,986
Napa	971,748	884,221
Nevada	3,330,940	3,492,946
Orange	8,831,763	6,617,112
Placer	1,097,098	963,860
Plumas	161,308	745,715
Riverside	1,580,805	1,349,591
Sacramento	2,629,244	2,562,281
San Benito	436,259	642,065
San Bernardino	1,616,537	2,674,042
San Diego	315,267	211,129
San Francisco	119,889	128,270
San Joaquin	129,930	248,394
San Luis Obispo	63,465	227,632
San Mateo	246,478	177,891
Santa Barbara	2,686,309	3,984,966
Santa Clara	266,956	635,229
Santa Cruz	1,642,958	1,581,531
Shasta	5,047,838	8,350,133
Sierra	725,129	729,518
Siskiyou	385,825	514,094
Solano	1,683,866	1,335,923
Sonoma	326,144	276,104
Stanislaus	² 5,882	191,771
Sutter		
Tehama	300	4,702
Trinity	747,282	499,511
Tulare	161,252	184,599
Tuolumne	1,050,928	1,171,438
Ventura	1,000,729	904,767
Yolo	736	2,040
Yuba	2,823,282	2,862,430
Asbestos, unapportioned	1,530	
Totals	\$93,314,773	\$96,663,369

¹Includes output of a gold dredge in Stanislaus County. ²See Merced.

Other Activities.

In addition to the foregoing, work on a set of county mineral maps of standard size and scale has been satisfactorily forwarded, although considerable time will yet elapse before it will be possible to make them available for distribution. These maps will show the location of every known mineral property in the various counties, as well as being up to date as regards highways, wagon roads, towns, post offices, stage routes, streams, etc.

The work of the Petroleum Department has continued to expand, and arrangements have been provided for specially constructed office quarters in two of the principal oil fields, which will provide ample space for filing valuable records in fireproof vaults. In these buildings there are also to be maintained peg models of the oil fields for the benefit of those interested.

The Mineral Museum which is maintained by the Bureau in the Ferry Building, San Francisco, has always been one of its most interesting adjuncts. This museum is visited by many thousands of persons annually, and it affords striking visual evidence of the diversity of the mineral products of the state in a manner which could be obtained by no other means.

The Laboratory, in which free determinations are made of all mineral specimens sent in by citizens of the state, is an assistance to the mining public which can not be adequately estimated. Not only prospectors, but engineers and geologists in large numbers, avail themselves of the opportunity thus presented to obtain accurate and authoritative information relative to samples and specimens of doubtful or unknown value which they have discovered or otherwise obtained. This assistance is of particular value as regards the rarer minerals, the appearance of which may often be unfamiliar even to mining men of long experience.

The Library, Reading Room and general offices in the Ferry Building have been renovated and remodeled, with the single idea in view of increasing the ability of all members of the Bureau to satisfactorily serve the interests of those who call for information and advice.

The Library is well known to the western mining public. It contains more than 5000 volumes of scientific and technical reference books covering all features of the mineral industry, as well as allied subjects.

Future Plans.

As regards the future plans of the Bureau, it may not be amiss to state that there is in press a compilation of the United States and California Mining Laws, brought up to date. A catalog of the publications of the Bureau from the date of its inception in 1880 is also

in press; likewise, a preliminary report on manganese and chromium, which is to be followed by a bulletin on the same subject, the manuscript of which has been practically completed, and will be sent to the printer at an early date.

Field work has been completed, and compilation is well under way, on bulletins which will cover the following subjects: Quicksilver Resources of California, including chapters on metallurgy and ore dressing; Magnesite in California; Tungsten, Molybdenum and Vanadium in California.

Steps have also been taken to prepare a preliminary report, similar to the one on manganese and chromium, which will include information primarily intended to assist the buyer and seller of mineral substances in getting in touch with each other as regards nickel, molybdenum, antimony, tin, tungsten, graphite, strontium, and potash.

Plans have also been completed for the installation of a complete file of the Bureau's publications in its branch offices at Los Angeles, Santa Paula, Santa Maria, Taft, Bakersfield, and Coalinga. Not only will all publications be available for reference at these points, but bulletins and reports which are issued for free distribution will be supplied in sufficient numbers to meet the requirements of the local public.

Acknowledgment.

The hearty co-operation of the California mining public, which has at all times been accorded members of the Bureau, is a very important item, and one which has made possible the successful carrying out of the various plans which have been here enumerated. Sincere appreciation and thanks for this co-operation is hereby gratefully acknowledged.

It may appear, in some individual instances, that little compensation is received for the time and attention asked by the Bureau, but such minor sacrifices may result in great benefit to the mining public, as well as to the entire nation, when the information obtained has been correlated and placed in its proper position relative to the problem which may require solution.

The State Mineralogist also takes pleasure in making this public acknowledgment of the enthusiastic and efficient services which have been rendered by all members of the Bureau staff, and as a means of emphasizing this fact, and also illustrating the proportions which the

Bureau has attained, there follows the personnel of the staff as of June 30, 1916:

Personnel.

F. McN. Hamilton, State Mineralogist.
R. P. McLaughlin, State Oil and Gas Supervisor.
W. W. Thayer, Secretary and Cashier.
M. J. Kirwan, Deputy State Oil and Gas Supervisor.
R. B. Moran, Deputy State Oil and Gas Supervisor.
Chester Naramore, Deputy State Oil and Gas Supervisor.
R. E. Collom, Deputy State Oil and Gas Supervisor.
Walter W. Bradley, Mining Statistician.
Edgar Woodcock, Determinative Mineralogist.
W. Burling Tucker, Field Assistant.
Emile Huguenin, Field Assistant.
Clarence A. Waring, Field Assistant.
J. J. McDonald, Assistant Mining Statistician.
W. E. Condon, Geological Draftsman.
A. H. Brod, Laboratory Assistant.
Henry McCann, Clerk.
E. M. Connor, Stenographer.
Emma Cooney, Stenographer.
Walter A. Greer, Stenographer.
Edith Husted, Stenographer.
I. M. Johnson, Stenographer.
Arthur Nagle, Night Watchman.
H. F. Williams, Janitor.

FLETCHER HAMILTON,
State Mineralogist.

December, 1916.

FINANCIAL STATEMENT.

Sixty-sixth Fiscal Year. July 1, 1914, to June 30, 1915.

Receipts.

Balance from sixty-fifth fiscal year-----	\$358 87	
Appropriation, sixty-sixth fiscal year-----	40,000 00	
		<u>\$40,358 87</u>

Disbursements.

Geological salaries -----	\$9,276 96	
Bureau salaries -----	12,738 31	
Traveling expenses -----	5,038 20	
Rent -----	1,935 00	
Laboratory -----	241 44	
Library -----	159 23	
Museum -----	36 79	
Postage -----	919 49	
Sundries -----	4,057 46	
Printing -----	5,853 51	
		<u>40,256 39</u>
Balance of fund not expended-----		102 48
		<u>\$40,358 87</u>

Sixty-seventh Fiscal Year. July 1, 1915, to June 30, 1916.

Receipts.

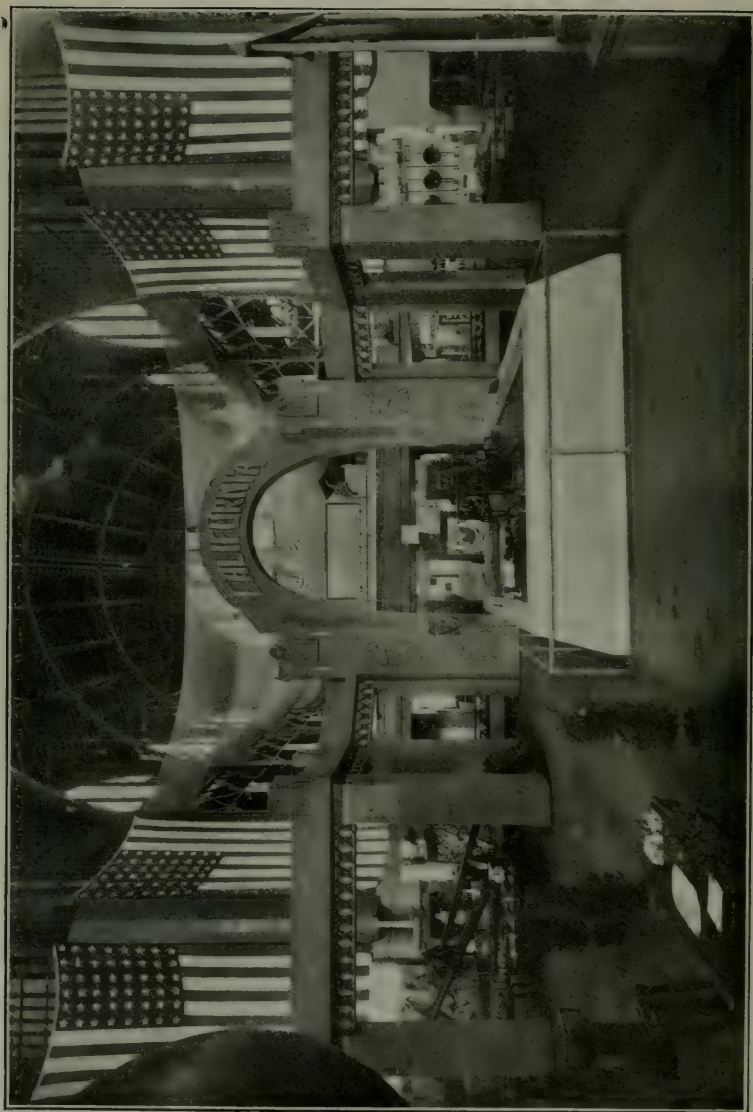
Appropriation sixty-seventh fiscal year-----	\$45,000 00
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Disbursements.

Geological salaries -----	\$9,869 81	
Bureau salaries -----	18,697 30	
Traveling expenses -----	3,486 44	
Rent -----	1,990 12	
Laboratory and museum-----	343 45	
Library -----	288 43	
Postage -----	1,001 02	
Printing -----	3,484 66	
Sundries -----	5,255 58	
		<u>\$44,416 81</u>
Balance of fund not expended-----		583 19
		<u>\$45,000 00</u>



East entrance to the California State Mining Exhibit, Palace of Mines, P. P. I. E., 1915.



West entrance and model dredger, in California State Mining Exhibit, Palace of Mines, P. P. I. E., 1915.

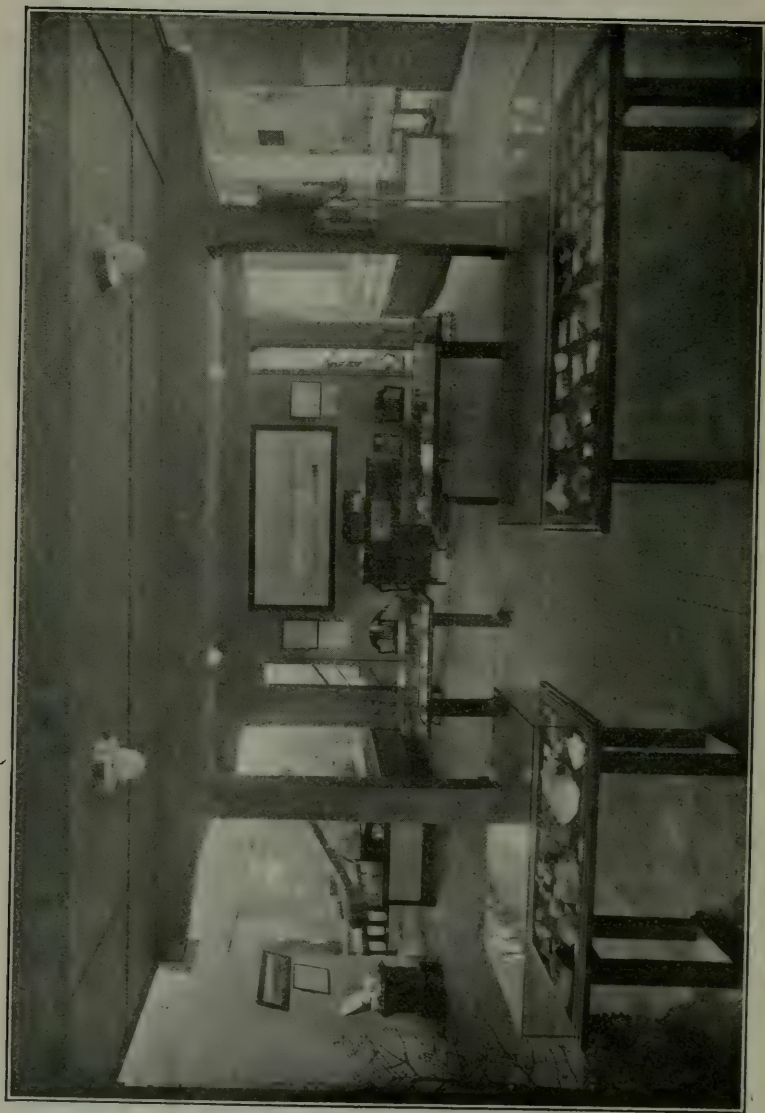
PARTICIPATION OF THE CALIFORNIA STATE MINING BUREAU IN THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

The State Mineralogist co-operated with the California State Commissioner since the State Mining Bureau received no appropriation with which to finance a mining exhibit. Assistants were detailed to various sections of the state and a representative exhibit of California's minerals was gathered together and placed in the commodious quarters offered just east of the central dome of the Palace of Mines.

The arched entrance on the east side of the exhibit included an adaptation of the great seal of the State of California, while on its sides were portrayed, by sculpture, the various mineral industries of the state. The west arch entrance had, at its approach, a working model gold dredge, while through the arch visitors viewed a life size portrait of Governor Hiram W. Johnson, executed in native mineral colors.

The arched entrance on the east side of the exhibit included an site which were two safes in which valuable gold specimens were displayed. The north end of the space was occupied by a model hydraulic mine, a glass model of the Mammoth Copper mine, a model assay office, an arrastre, and a working stamp mill. The south end was equipped with model 10-stamp mill, paint exhibit, and display of photographs of California mines, mills, dredgers, etc. Ores of each mineral occurring in the state were arranged, alphabetically by counties and mines, in large show cases. On a large platform above the central portion of the exhibit was a peg model of the Midway-Sunset oil fields.

A collection of gold and platinum specimens loaned to the State Mining Bureau were arranged in two safes. Excellent specimens of crystallized and wire gold from the Bondurant mine, Mariposa County, and the Sugarman mine, Tuolumne County, were particularly noteworthy. Rich specimens from the Lookout Mine, El Dorado County, the Alaska mine, Sierra County, and the Homestake mine, Siskiyou County, showed what values are found in the California mines. Gold nuggets from Siskiyou and Trinity counties and platinum nuggets from Trinity County were representative of the placer mining industry.



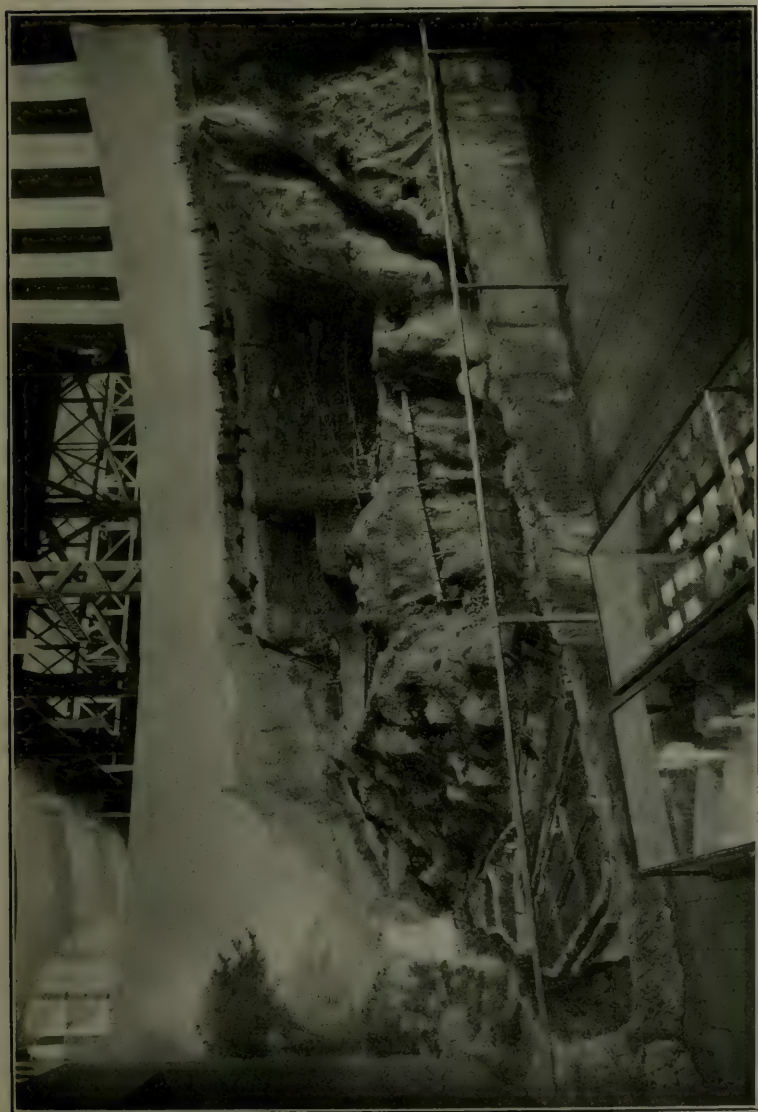
Center of exhibit, and attendant's desk, at California State Mining Exhibit, Palace of Mines, P. P. I. E., 1915.



Gold and platinum display in east safe of California State Mining Exhibit, Palace of Mines,
P. P. I. E., 1915.



Gold display in west safe of California State Mining Exhibit, Palace of Mines,
P. P. I. E., 1915.



Miniature hydraulic mine, designed and exhibited by the California State Mining Bureau, Palace of Mines, P. I. E., 1915.

The miniature hydraulic mine, designed and exhibited by the State Mining Bureau, was a working example of one method used for extracting gold from the buried river channels of the Sierra Nevada Mountains. Three small monitors played streams of water against a gravel bank, the water passing down through sluice boxes where the gold was caught on riffles. The coarse gravel was caught in a cement retaining dam and the cleared water, carrying a small amount of fine silt, was carried in ditches and flumes to valley farms for irrigation purposes.

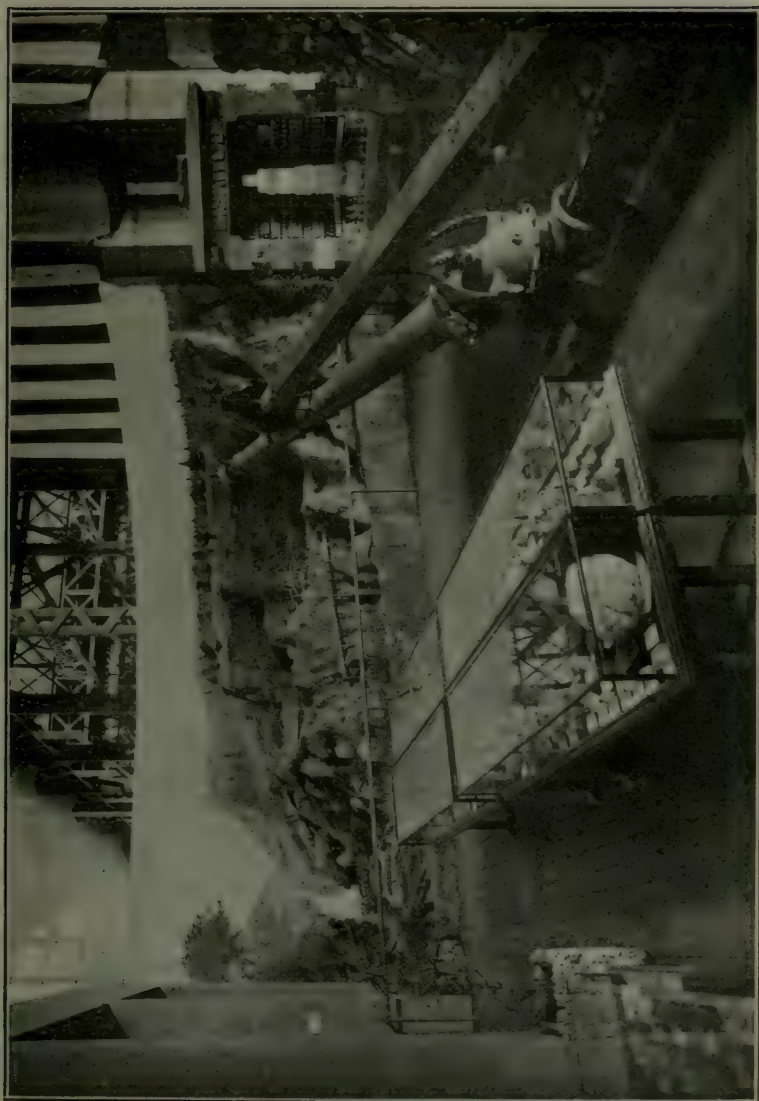
A working model of Yuba Gold Dredge No. 14 occupied a cement basin in the center of the Palace of Mines. The hull and machinery were built on a scale of 1 to 20; the ladder and buckets were built on a scale of 1 to 12, and a one-sixth horse-power electric motor one sixteen-hundredth the size of that used on No. 14, ran the bucket line and ladder-hoist winch. The model demonstrated the process of extracting gold in the Feather, Yuba, and American rivers, in northern California, where gravels, often buried to a depth of 70 feet, are excavated and passed over gold-saving tables.

A model ten-stamp mill with amalgamation and concentrating tables was operated by electric power. It demonstrated the most practical method of extracting the metallic content from gold-bearing ores. An arrastre and a working stamp mill placed side by side demonstrated the advance made in milling methods.

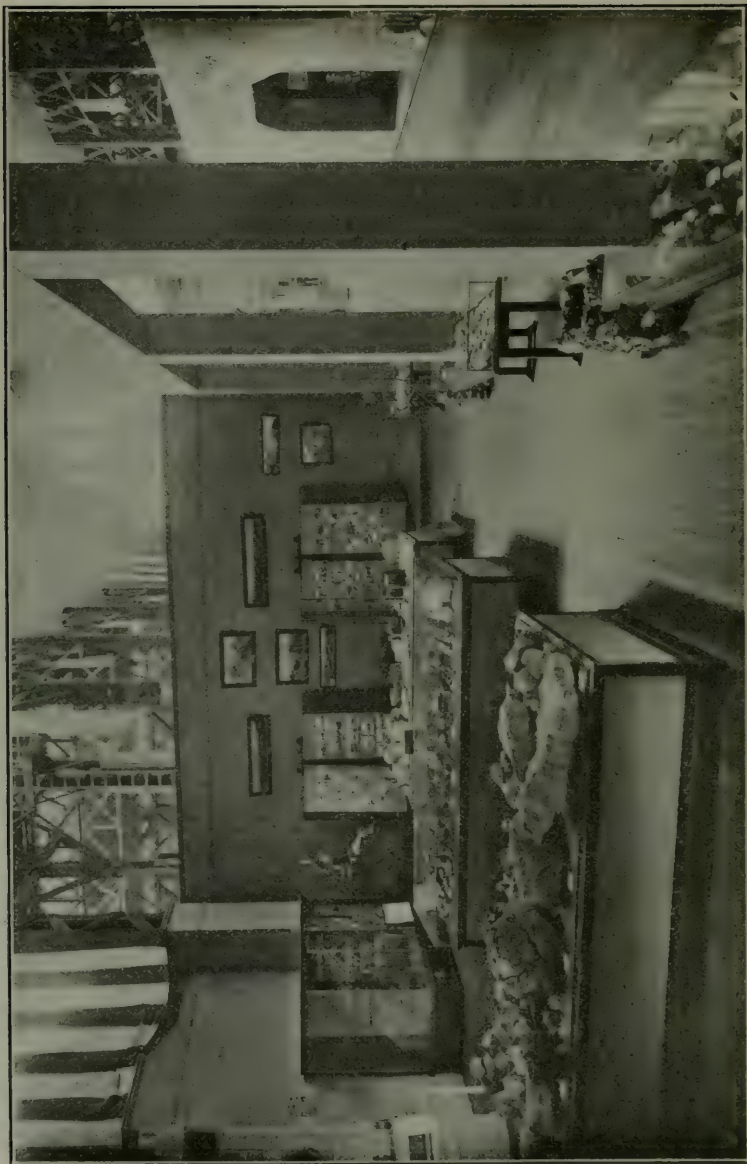
An up to date assay office included jaw crusher, pulverizer, furnace and balances. Ore samples were run during certain hours each day for exhibition purposes.

A peg model of the Midway oil field was installed on a platform over the center of the exhibit and was reached by stairs on either side. The model, about 18 by 24 feet, clearly portrayed the underground structure of the Midway-Sunset oil field, so that any layman might obtain a good general idea of the underlying principles of oil geology. Both the horizontal and vertical scale used were 150 feet to one inch. Each well was represented by an aluminum peg, the top of which represented the surface elevation of the well. The bottoms of the wells were marked on the pegs by heavy black lines. A narrow black sea-level line on each peg clearly outlined the horizontal plane to which all measurements were referred. Red lines on the pegs represented the various thicknesses of oil sands and these were correlated by being connected with red string. Water sands were indicated by dark green lines on the pegs. The monoclinal and synclinal structures were easily traceable.

A large case of gold ores from every gold producing county in the state showed clearly the wide range of variation in the different types of gold occurrence.



Hydraulic Giant and model hydraulic mine in the California State Mining Exhibit, Palace of Mines, P. I. E., 1915.



Model stamp mill, ore and building stone, and photograph displays in California State Mining Exhibit, Palace of Mines, P. I. E., 1915.

Silver with its commonly associated minerals were represented by several specimens of high-grade ore from San Bernardino and other counties, and by a large case of specimens from the Cerro Gordo mine, Inyo County.

The quicksilver mines were particularly well represented by fine specimens of ore, both average and high grade, and by the refined product.

A variety of rich tungsten ores and several fine specimens of native antimony were exhibited from Kern County.

Copper specimens from all parts of the state were arranged in a large case so that the different character of ores might be compared. Shasta County was particularly well represented, and a large glass model of the Mammoth mine showed the complete workings and outlined the ore-body. A large specimen of copper, silver, lead, zinc ore from the Afterthought mine, Shasta County, represented a rich ore, which has as yet not been worked profitably because of metallurgical difficulties.

Rich iron, chrome, and manganese ores, and magnesite, asbestos, clay, talc, glass sand and diatomaceous earth were arranged in appropriate cases. Building stones such as granite and limestone were displayed on open tables where the visitor might more closely observe their qualities. Gem materials, including a few cut stones of tourmaline, kunzite, beryl and opal were characteristically arranged in cases in the center of the exhibit.

Medals of honor were awarded to the California State Mining Bureau for its collective exhibit of the mineral resources of the state and model of a typical hydraulic mine. In conjunction with the California state exhibit, the Bureau was also awarded a medal of honor for a collection of crystallized and wire gold, leaf gold, nuggets, free gold in quartz with associated minerals and high-grade gold ores.

Medals of honor were awarded to participating counties as follows:

Alameda—Marble, limestone, magnesite, quartz, glass sand, kaolin, clays, and borax.

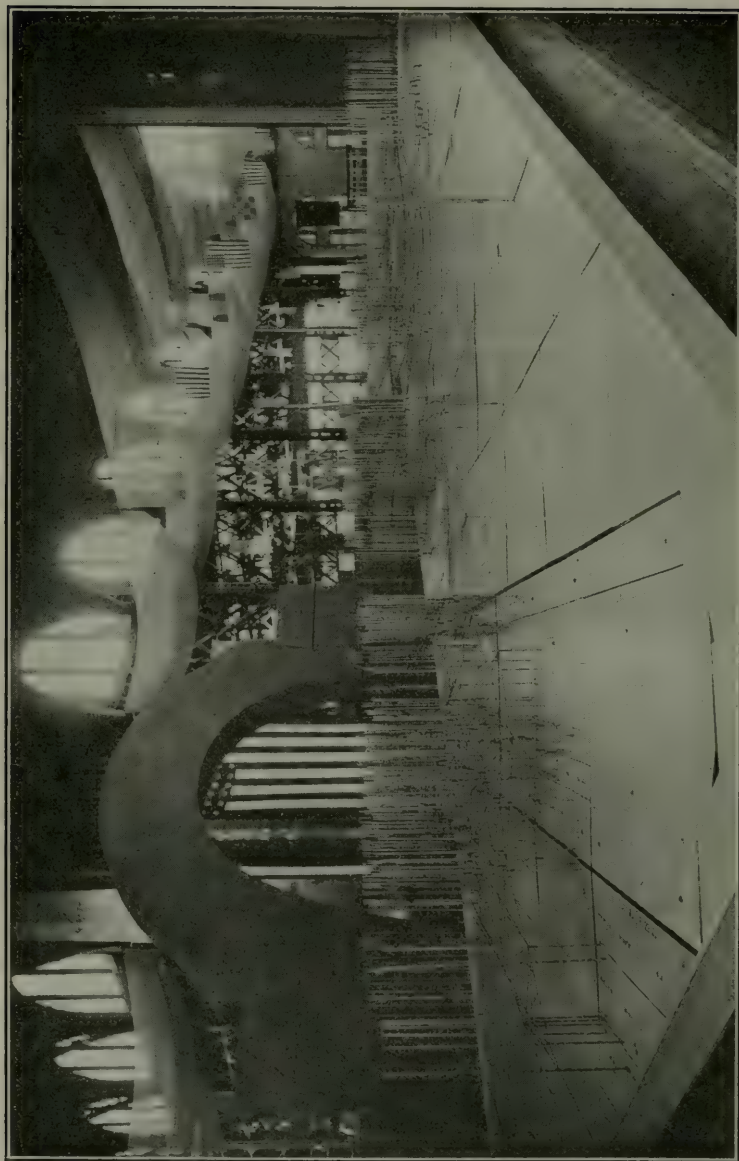
Imperial—Pumice stone.

Kern—Petroleum, building stone, marble, limestone, gypsum, diatomaceous earth, gold, silver, chromite, iron, and manganese.

Los Angeles—Building stone, brick, diatomaceous earth, salines, and salt.

Monterey—Salt and asphalt.

Riverside—Marble, limestone, quartz, glass sand, rare minerals and gems, clay products, copper, manganese, tin, lead, chromite, and iron.



Peg model of the Midway Oil Field, in California State Mining Exhibit, Palace of Mines, P. I. E., 1915.

San Bernardino—Building stone, limestone, gypsum, fluorspar, tale, gems and precious stones, graphite, copper, gold, silver, lead, chromite, iron, tungsten, sulphur, salines, and marble.

San Diego—Gems and building stone.

Santa Barbara—Petroleum and diatomaceous earth.

Santa Clara—Comprehensive exhibit of quicksilver ores, marble, and mineral products.

Shasta—Gold, silver, iron ore, pig-iron smelted by electric process, lead, zinc, manganese, marble, limestone, gypsum, stalactites, and asbestos.

Siskiyou—Placer gold and gold quartz, copper, lead, building stone, mica, tourmaline, and mineral waters.

Solano—Building stone and cement.

Ventura—Marble, limestone, and gypsum.

Amador, Mariposa, Trinity, Tuolumne, El Dorado, Sierra, Plumas, and Yuba counties were represented by individuals or by companies, 27 of whom received medals of honor.

A grand prize was tendered to the Kern County Protective Association for its remarkable peg model of the Midway-Sunset oil field, characterized by the jury as "a model of great technical, educational and industrial value." Gold and silver medals were given to the collaborators of the model. Gold medals were awarded to the Cowell Lime and Cement Company for their exhibit of Mt. Diablo cement; to the Mammoth Copper Company for its mine model and exhibits of ores and copper products, and to the Straub Manufacturing Company of Oakland for their stamp mill. Silver medals were awarded to the Cerro Gordo Mining Company for their exhibit of silver, lead, and zinc ores; to F. B. Schuyler for an exhibit of tourmaline from San Diego County, and to Mrs. Arthur Rogers for polished Santa Clara County marble. A bronze medal was given to A. Blanc of San Francisco for his exhibit of native antimony from Kern County. A medal of honor was given Fred Grotefend of Redding for his exhibit of gold and copper specimens from Shasta and Trinity counties.

Conclusion.

It is felt that the California state mining exhibit was especially successful because of the active interest and stimulus given it by the office of the State Mineralogist. The state's prominence as a mineral producer received substantial recognition by the international jury of awards at the exposition.

PART I

Alpine County
Inyo County
Mono County

By ARTHUR S. EAKLE, Ph.D., EMILE HUGUENIN, R. P. McLAUGHLIN,
and CLARENCE A. WARING, Field Assistants

PREFACE.

The group of counties here presented lies southeast of Lake Tahoe along the eastern boundary of California. They flank the Sierra Nevada Mountains to the east and southeast and include Mono and Owens lakes.

Of the three counties, Inyo is the best provided with transportation facilities and power. The southeastern and central portions of Mono County are fairly well served, but Alpine County has neither railroads nor power lines and is only partially served by roads.

The counties present a diversity of mining interests and offer inducements to those who are used to mining under difficulties. High transportation costs, high wages, and high general operating expenses all tend to discourage the operation of low grade properties.

Acknowledgment is made of the courtesies extended by the mine owners and operators throughout the region, whose assistance made this report possible.

ALPINE COUNTY.

By ARTHUR S. EAKLE, Ph.D., Field Assistant.
Field work in July, 1914, and July, 1915.

INTRODUCTION.

Mining began in Alpine County over fifty years ago, and during the first twenty years a large amount of ore was taken out.¹ Long and expensive tunnels were run which never paid for themselves, and the ore that was obtained could not be successfully treated at the mine, although much money was expended in mills, roasting and amalgamating plants. The mines were for the most part abandoned as unprofitable and towns of several thousand inhabitants completely disappeared so that not a vestige of them remains. Alpine County at the last census contained but 300 inhabitants and it has but one town—Markleeville—which is the county seat. The abandonment of the mines of the county was not due to exhaustion of ore, of which there is an abundance, but rather to the fact that the average value was low, and being mostly a base ore requiring special smelting with smelters far distant and no adequate method for good concentration, it could not be handled at a profit. Very little of the ore was free milling and mills were built for this kind of ore. In fact the county contains evidences of reckless expenditure of capital in erecting plants which were absolutely worthless. For a long period of time there has been no mineral returns from the county, and the only mining that has been done has been in the line of development work and proving up the value of the properties.

¹Min. Res. W. of Rocky Mts. 1871, pp. 51-53; 1873, pp. 11-16.

Table of Mineral Production of Alpine County, 1880-1915.

Year	Gold	Silver	Copper		Miscellaneous
			Pounds	Value	
1880.....	\$17,133	\$24,146			
1881.....	2,000	2,100			
1882.....	20,000	10,000			
1883.....	10,000	5,000			
1884.....	5,000	4,000			
1896.....	400				
1897.....					
1901.....	23,568	2,860	8,377	\$1,319	
1902.....	10,359	3,770			
1903.....	2,701	146			
1904.....	4,827	145			
1905.....	575				
1909.....					
1913.....	537	4			
1914.....					
1915.....					
Totals.....	\$97,100	\$52,171	8,377	\$1,319	Unapportioned, 1900-1909 \$5,465
					\$5,465

Totals.

Gold	\$97,100
Silver	52,171
Copper	1,319
Unapportioned	5,465
Grand total	\$156,055

After the Comstock strike, the county was prospected pretty thoroughly and there are plenty of tunnels and holes to testify to the work done. Practically nothing so far has been published about the ore bodies which are so extensively indicated by outcrops. The Eighth Annual Report of the State Mineralogist, William Irelan, Jr., published in 1888 gives the best description of the mines and what was being done at that period. The bullion output at that time was very little, and in fact it has never been in any way proportionate to the amount of ore extracted. In the above-mentioned report, Mr. Irelan predicted that the output of bullion from the county would probably increase to much larger proportions and perhaps in a short time. It is now nearly thirty years since that prediction was made and it has not been fulfilled, yet the prediction was justified, and the present writer has no hesitancy in repeating it with the belief that it will soon be a reality.

GENERAL FEATURES.

Practically the entire area of the county is occupied by mountain ridges and peaks. It is crossed by the great granite mass of the Sierras and flanking the granites on the east are flows and eruptions of Tertiary volcanics, largely andesites. The ridges and peaks of granite and of andesite attain an elevation between 7000 and 8000 feet, while some of the peaks rise to the height of over 10,000 feet. Deep cañons dissect the ridges, breaking up the country into hills and crags. There are

a few valleys, mostly above 5000 feet in elevation, and as the county is well watered these valleys serve as grazing land for stock. Little agricultural work is done, but wheat and alfalfa can be grown. The summer season is naturally short with liability to heavy frosts at any time, so general produce raising is not undertaken and all supplies have to be brought into the county.

The principal streams are the two forks of the Carson River. The East Fork, or East Carson, has its rise in the south central part of the county and flows northward through its cañon across the state line into Nevada, watering the broad and fertile Carson Valley. The West Fork, or West Carson, rises in the western part of the county and flows through Hope Valley and then eastward through its cañon and also helps water the Carson Valley. There are many important creeks flowing into these main streams, some of which furnish a permanent supply of water, like Markleeville Creek, Silver Creek, Wolf Creek, Silver King Creek and Monitor Creek. The Mokelumne River has its source in the southwestern part of the county on the western side of the divide. Besides the flowing streams, there are several lakes, and the Blue Lakes are the most important and used for water supply. The county is well watered and well timbered. Two good highways make the county accessible. The main road connects Markleeville with Minden and continues south through the East Carson Cañon to Silver Creek Cañon and thence westerly over the divide into Calaveras County through Big Trees. Minden is the southern terminus of the Virginia and Truckee Railroad, a short road running south from Reno, and all supplies and mail are brought to Markleeville by daily stage from this station. At Woodfords a branch road forms the second highway. This runs westerly through the West Carson Cañon and down through Hope Valley to the Blue Lakes region. A road connecting with this goes to Lake Tahoe, and auto tourists make the trip from the lake by the Alpine scenic roads through the county and over the pass to Angels.

A short road goes from Markleeville to Grover Hot Springs. Off from the few roads the country is accessible only by trail.

MINING DISTRICTS.

So many claims were located in the early days that the county was pretty well divided up into districts. Most of the claims were never worked and few of the districts ever produced any bullion. The records of these old districts have become a matter of history and tradition. The old districts described in the 8th Annual Report above referred to were the "Monitor," the "Mogul," the "Silver Mountain," the "Silver King" and the "Hope Valley" and "Blue Lakes" districts. The records of these districts are mostly of tunnels run so many feet into the mountains and then abandoned.

The Monitor and Mogul districts have been the most important and more recent work has been done in them. The others have been deserted for years.

This report is mainly devoted to the two principal districts, for any future mining in the county will probably be chiefly done in them.

THE MOGUL AND MONITOR DISTRICTS.

These two districts are contiguous and the claims border respectively on the Mogul and Monitor cañons, which are about one and a half miles apart. The districts are some six miles south of east of Markleeville, and a road branches off from the main highway and follows up the Monitor cañon to the mining sections of the districts. Loope, or Monitor, as it was first called, was the mining camp for the Monitor district, and was once a thriving town with a post office and daily stage; now only a more or less dilapidated hotel building remains to mark the spot. The road from Loope ascends in the cañon between Colorado Hill and Morning Star and other hills on the east, and taps the Mogul district. The two principal hills from which ore has been formerly mined are the Colorado Hill, on which many of the claims of the Monitor district are located, and the Morning Star Hill, which contains the principal claims of the Mogul district. The accompanying maps of claims (Plates I and II) will give some idea of their situation in the two districts.

The Curtz Consolidated Mines Company with office in Oakland own seventeen claims in the Mogul district and tunnels exist on some of them. There are several groups of claims in the Monitor district, those owned by the Hercules Consolidated Mines Company of Reno being the most important. Other groups are the Lincoln, the Globe and the Flint. Very few of the claims of either district have been patented. The Morning Star Mine of the Curtz Company and the Colorado No. 2 of the Hercules Company are the two most famous mines of the county and both have produced considerable bullion.

ROCK FORMATIONS OF THE DISTRICTS.

This particular section of the county is wholly volcanic and the rock is andesite of Tertiary and later eruptions. The main country rock forming the hills containing the ore bodies is a compact and somewhat porphyritic andesite from an ash-gray to practically black color. The volcanic rock of the region varies greatly in texture, and eruptions have apparently succeeded eruptions and flows. Much of the rock is very coarse breccia or agglomerate with large fragments of grayish andesite cemented by ash and cinder, forming coarse tuff-breccias. The main rock is a hornblende-biotite andesite, but the magnesian silicates are not prominent in most of the rock. Feldspars or the phenocrysts and

groundmass of the rock and the feldspar phenocrysts show characteristic albite twining and are labradorite. The feldspar of the base shows much calcite with epidote and chlorite stains as alteration minerals. Small grains of magnetite and pyrite can be seen in the thin section. Occasionally the mass of rock shows a flow structure and in its weathering a banded or schistose effect is produced. Slate-like and schist-like outcrops of the weathered rock occur in Monitor cañon. Black basaltic masses occur exposed along the highway which seem to be a basaltic phase of the andesite rather than true basalt. This black rock is finer grained, but still retains the porphyritic structure of the andesite. The groundmass contains granular augite, but the phenocrysts are feldspathic.

The only other volcanic rock in the immediate district is a glossy perlite or obsidian. It occurs on Morning Star Hill in an outcrop of light gray translucent lava and appears to be a later dike intrusion in the andesite. The dark andesite masses forming the wall-rock of the cañons is continually breaking off into angular, sharp-edged fragments, forming a sharp shingle. The rock is full of incipient fractures and joints, and disintegration more than decomposition is the result, especially from the freezing and thawing action of winter.

SILICIFICATION OF DISTRICTS.

There is no other section of California in which silicified bodies of rock more or less mineralized have been formed on a scale of such magnitude as occur in this region. Huge outcrops of cherty and jaspery rock jut above the surface of the hills and extend in some cases several thousand feet with a width of thirty or more feet. They appear as ridges and isolated jagged bodies above the till covered hills, owing to their hard siliceous nature and weathering action has tended to leach out much of their feldspathic material, leaving practically chalcedonic and jaspery silica masses. The oxidation of their iron and manganese contents have given them shades of pinks, reds, yellows, browns and blacks, as surface colorations. There is a wall-face exposure of beautifully painted rock in tints of golden yellow and pink and red on the Flint group of claims in the Monitor district. These silicified outcrops cut across the hills in differing directions, and cross cutting in the mines has shown the presence of others not perceptible on the surface, so there is no common strike for them, although the main ridges in the Mogul district have a north and south direction of elongation. On the Morning Star Hill the outcrops appear as separate isolated patches, and in order to connect them up into one zone of silicification, considerable displacement by faulting must be assumed. The small sketch (Plate I) of the outcrops of this district made by J. O. B. Applegreen shows how

these outcrops may have become displaced, yet there is no actual proof that these bodies originally formed one continuous zone.

The dip of the outcrop on the Morning Star Hill appears to be to the south and as much as 45%, but the dip is deceptive and judged by the enclosing andesite. Tunnels into the side of the hill below the outcrops have shown this and probably most of these silicified masses stand practically vertical. While the exposed portions of these silicified bodies are hardened siliceous rock, beneath the surface the bodies are softer and in general quite friable, easily crushed and altered. Much of it is granular quartz intermixed with feldspathic material. Hard masses of grayish flint are occasionally encountered surrounded by softer material. The only accessible tunnels in the Mogul districts are high up and in the zone of constant oxidation and alteration, consequently the whole mass is bleached white and kaolinized, with frequent seams of white clay. Much of this condition has been brought about by acidified surface waters, and it is quite impossible to say how much has been due to ascending solutions. These silicified zones are prevalent in the andesites flanking the Sierras on the east and extending over Nevada.

Origin of the silicification.

The formation of these great bodies of silicified rock has been due to ascending hot solutions, altering and silicifying the andesite. These hot waters have coursed upward through channels, fissures and pores of the volcanic rock, entirely changing its character by dissolving and leaching of much of the feldspathic and silicate contents of the rock and leaving or precipitating a silico-feldspathic mass with seams of chalcedony and clay. Some of the channels have extended for long distances and the siliceous material forms a long outcrop, such as the "Great Mogul Ledge," as it is called. Other channels have been short, causing the formation of isolated bodies. It is quite possible that the Kennebeck Mountain and some of the outcrops on the hills may be of this character.

The bodies are considered as lodes in the districts, but they are not fissure-fillings and do not in general have well-defined walls. Of course, there are cases where the former fissures may have become filled with the altered rock and thus forming veins, but the general mass has its origin in impregnation of porous andesite rock by the hot solutions. The solutions were the magmatic waters associated with the volcanic eruptions of the andesite, welling up through the rock and transposing it. The depth to which these bodies may attain is only surmisable. They may run down the full depth of the andesite in a wide body or they may pinch out. Just how deep the andesites are can not be determined. Solutions may traverse a fissure until a porous, easily affected mass of

the rock is encountered, with the result that the silicified mass is simply an enclosed body. Only the upper portions of these bodies have so far been penetrated. There has been no attempt to drill or go down directly on one of them to prove its downward direction or size. Long tunnels have been run from the sides of the hills to strike them, without sufficient accurate data concerning them, and in this way money has been expended without returns.

THE ORE DEPOSITS.

All of these silicified bodies are mineralized, and at the present time of profitably working very low grade rock, all of them can be classed as ore bodies. Mineralization accompanied the silicification and alteration and probably the minerals were precipitated from alkaline solutions. These solutions must have had a complex composition. In addition to being sulphide solutions they contain arsenic and antimony, with the result that the sulphosalts are quite prominent in the ores as well as the common sulphides, such as pyrite, chalcopyrite, chalcocite, galena, sphalerite, etc. The sulphosalts occur probably in the higher portions of the deposit with the sulphides predominating below, but this is a hypothetical statement. Silver and copper are the principal metals, although gold forms an important part of the ores. The silver and copper as minerals appear to be present as sulphantimonites and sulpharsenites rather than as simple sulphides. The mining that has been done indicates that a marked difference exists in the ore deposits of Colorado Hill from those of the Morning Star Hill. The andesite rock occurs in various phases of structure, but there is nothing to prove different periods of eruption or different periods in the formation of the silicified bodies. There is, however, a difference in the minerals. The Morning Star deposits are essentially copper, the chief mineral besides pyrite being the sulpharsenite enargite, whereas the deposits of Colorado Hill are essentially silver, with lead and zinc and but little copper. Furthermore, the zones in the western side of the districts bordering the Carson River Cañon have much free gold associated with silver minerals, and this occurrence appears to be quite local. Gold and silver occur throughout the whole section, but the first not in free state and the second not always as a recognizable silver mineral. Arsenic appears more abundant in the Mogul district and has consequently caused the formation of enargite rather than chalcopyrite, which latter is the copper mineral of the Monitor district. Also manganese appears to be more abundant in the Monitor district and the black oxides coat the walls of the tunnels. However, not enough underground work has been done to justify conclusions about the relative abundance of the various minerals.

THE MINERALS OF THE ORES.

Pyrite is the commonest of the sulphides. It is disseminated in crystals and grains throughout much of the rock and also has been found massive. It contains gold, but only in small amounts. The assays of the outcrops in the Mogul district show values in gold from one to five dollars and this has been derived largely from the oxidized pyrite. Enargite appears so far to be limited to the Morning Star Hill of the Mogul district. It was first struck in 1863 by running a tunnel into the hill to pierce an outcropping body of rock. Very rich masses of it were found and assays showed values up to \$300 per ton. An analysis of the enargite was made by E. W. Root in 1868, which gave

Sulphur	-----	31.68%
Copper	-----	47.21
Arsenic	-----	14.06
Antimony	-----	6.19
		<hr/>
		99.14%



Photo No. 1. Curtz Consolidated Mines Co. Showing mountain of gold-bearing outcrops on north side of Mogul Valley coursing north and south across valley. Outcrops course also east from mountain.

Antimony apparently replaces the arsenic to a considerable extent and the mineral is grading toward famatinite. The sulphantimonite, enargite, is black while famatinite is reddish brown, and this latter color is seen in some of the ore. The analysis takes no account of the gold and

silver which it carries. One ounce of gold and 100 ounces of silver have been obtained. Wherever the enargite occurs the ore becomes high grade, averaging \$50 to \$100 per ton. It is not disseminated evenly in the deposits, but rather as pockets. It is intimately associated with pyrite and the two minerals seem to have been crystallized together. There is no indication that any of it occurs other than as a primary mineral of the deposit. Its composition would indicate that it belongs to the upper zone of the deposits and may be succeeded lower down by the sulphide of copper. At present the lowest level is 480 feet and it is present on this level in abundance.



Photo No. 2. Curtz Consolidated Mines Co. West side of outcrop on south side of Mogul Valley showing site of proposed tunnel which will cut the lode 500 feet below surface. The feasibility of quarrying the whole mass from this point, 3000 feet in length, under mountain of outcrop seen in Photo No. 1, will be noted.

It is difficult to differentiate the silver minerals, and it is only in the ore from the mines in the Monitor district that we see them. Much of the richer siliceous rock has gray metallic granular sulphides blotching the rock. Argentite, polybasite, pyrrargyrite, stephanite, stromeyerite and argentiferous galena and tetrahedrite have been observed. Perhaps argentite, polybasite and tetrahedrite are the main silver minerals. Gold as already stated occurs free in some portions of the districts and it can be panned from the ore of the Alpine Mine. It is present in the ore of all the mines presumably in the pyrite and other

sulphides and in the enargite. Tellurides are said to have occurred in the Colorado No. 2 mine. Streaks of pyrite and of clay and silica are occasionally encountered which assay several ounces in gold.

Practically all of the minerals cited in Bulletin No. 67 of this Bureau for Alpine County came from these districts.

Amount of ore.

Silicification has taken place on such a colossal scale that it leaves no question about the amount of available rock. There are millions of tons of it. The only question that can arise concerns its grade; whether it is sufficiently mineralized and carries values enough for profitable working. With our present facilities for handling very low grade ore, it does not seem that there should be any difficulty here. The pyrite is low grade but the ore does not depend upon the pyrite for its average. The mining that has been done in the past has conclusively proved the existence of high grade ore, some of it very high grade, and it has proved further that these high grade bodies are likely to be encountered frequently, and raise the general average value of the ore considerably above the safety margin. Much rich ore has been taken from these mines, mostly during the first twenty years after discovery, but the deposits have scarcely been touched.

THE MINES.

The two principal companies controlling the properties of these districts are the Curtz Consolidated Mines Company with an office in Oakland, and the Hercules Consolidated Mining Company with headquarters in Reno, Nevada. Besides these, there are individual claims, some with old tunnels, but all of them idle. Neither of the companies has done active mining for some time and their properties are for sale.

The Curtz Claims lie mostly in the Mogul district and the holdings consist of seventeen claims, on some of which old tunnels exist. The most famous ground controlled by the company is the old Morning Star Mine. On the hill above the workings several outcrops of the brown stained jasper rock occur, and in 1863 a tunnel from the north side of hill was run to cut one of these outcrops. At a distance of 775 feet from portal a large body of pure enargite mixed with pyrite was encountered, the mass ranging from 10' to 15' thick and 20' to 30' long. It was very rich ore, but at that time arsenical copper ores were a metallurgical problem to treat. Some of the ore was sent to Swansea, Wales, for smelting, after long hauling across the Sierra to the coast, but of course this could not be done with the average ore and consequently little has been done with any but the highest grade. The tunnel was continued through the hill and connected with a shaft at a distance of 922 feet from portal, and then was further continued



Photo No. 3. Curtz Consolidated Mines Company. Showing Great Mogul Lode coursing northeasterly and southwesterly into the lode shown in Photos No. 1 and No. 2. All of these outcrops are gold-bearing.

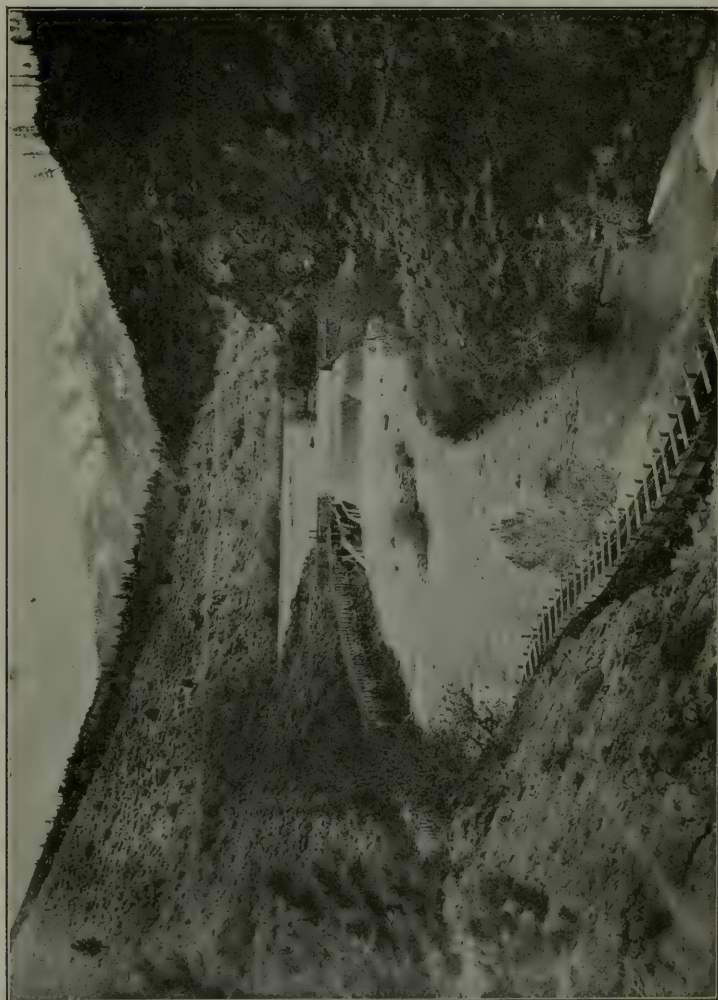
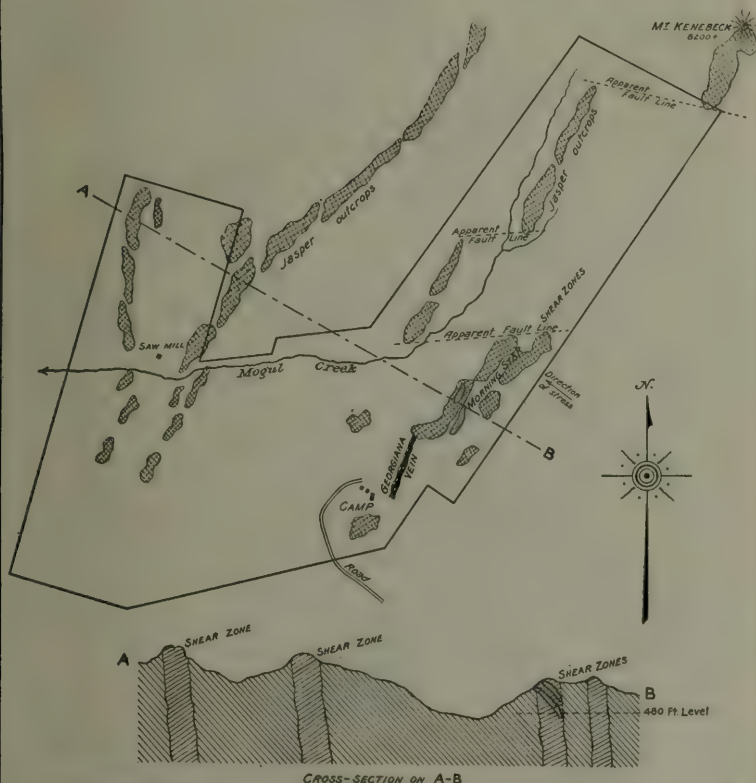


Photo No. 4. East Carson River. Flume for power house of the Curtz Consolidated Mines Co.

MAP OF
CURTZ CONSOLIDATED GROUP
MOGUL DISTRICT
ALPINE COUNTY, CAL.

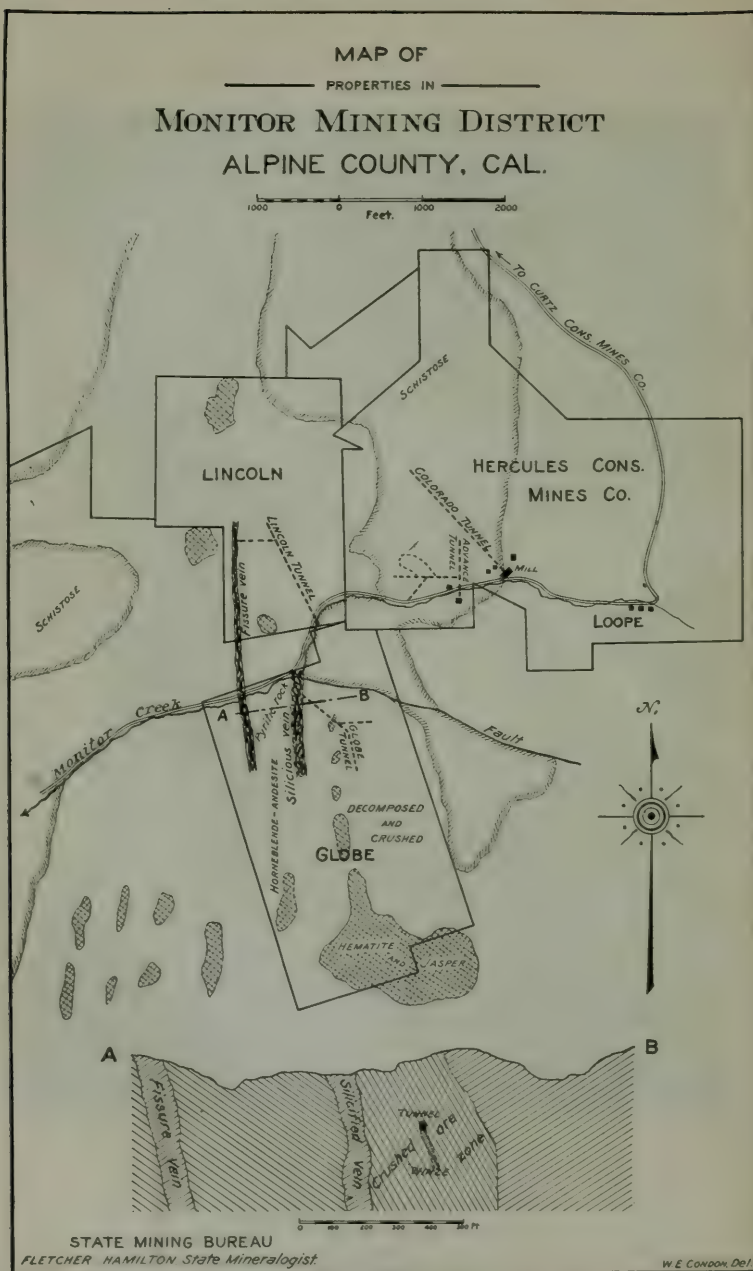
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STATE MINING BUREAU
FLETCHER HAMILTON, State Mineralogist

W.E. CONDON, Del.

Plate I.



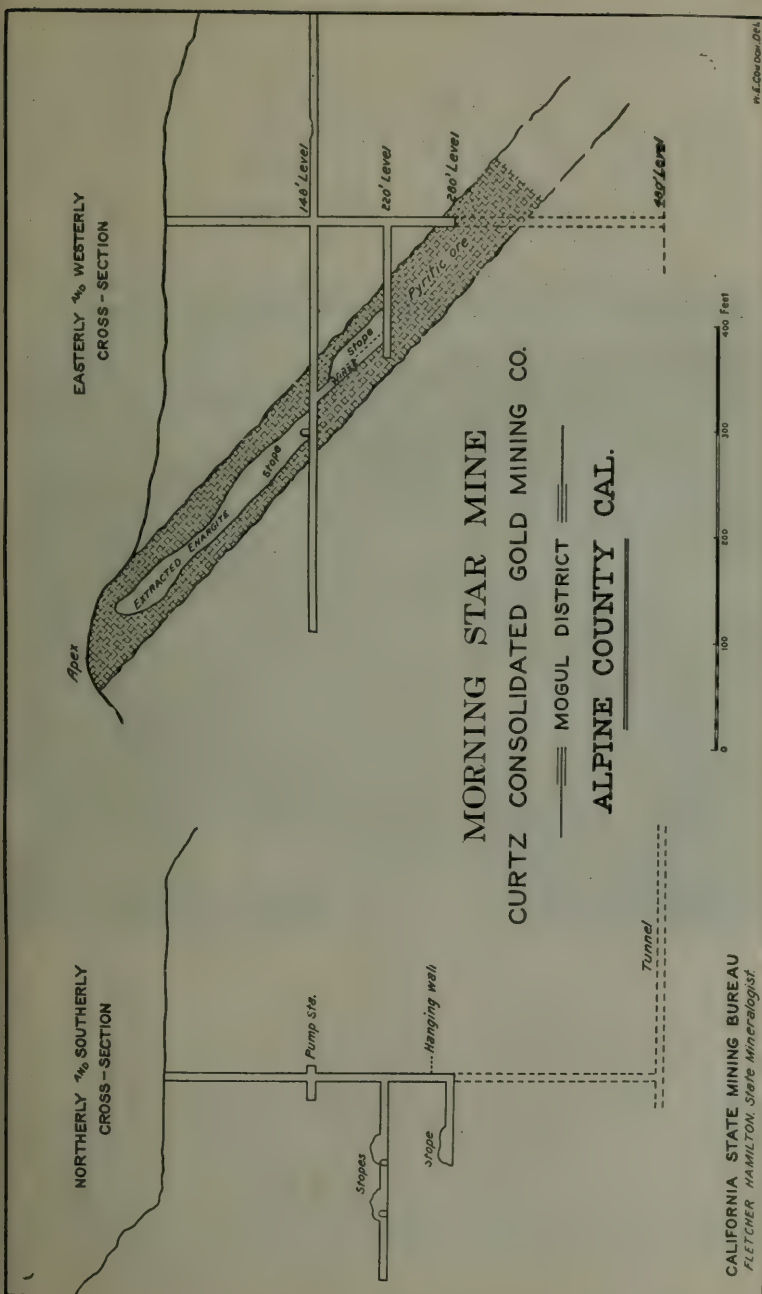


Plate III.

to opening on the south side of hill, but this was never finished. Drifts were made from this level and ore was encountered in various places which carried good values. In the large chamber from which the enargite was stoped, a winze was sunk to the 225-ft level and a tunnel connection made with the shaft. Not much work was done on this level. The shaft was continued down to 280 feet. All of the lower level is apparently flooded and much of the main tunnel of the mine is now inaccessible, although it can easily be cleared out. The draining off of the water below is more of a problem. In order to unwater these lower workings and at the same time prove up ore-bodies at a lower depth, the present company after it obtained control began a new



Photo No. 5. Old Alpine Mill, on East Carson River, now used for power house by the Curtz Consolidated Mines Co.

tunnel at the 480-ft. level on the southwest side of hill in the Georgiana claim, and this tunnel has been run some 2000 ft., but work has ceased and the connection with an extension of the old shaft of the Morning Star Mine has not been made. In their new tunnel good enargite has been encountered and assays have yielded over \$50 per ton for the ore.

The lowest workings in the hill are therefore only 480 feet deep from surface. How far down the enargite may continue is problematical. There is a strong possibility that bodies of chalcocite may occur due to secondary enrichment of the sulphide. Plate III shows vertical section

of the Morning Star. As only ore of the highest grade could be profitably shipped in those early days, it is quite probable the dumps may yield much payable ore.

The Alpine Mine also belongs to the Curtz Company. It occurs in the extreme western part of the Mogul district and the two or three adit tunnels are just at the head of a short cañon opening out into the Carson River Cañon. It is so conveniently situated above the river that an aerial tramway has been constructed to send down the ore to the mill

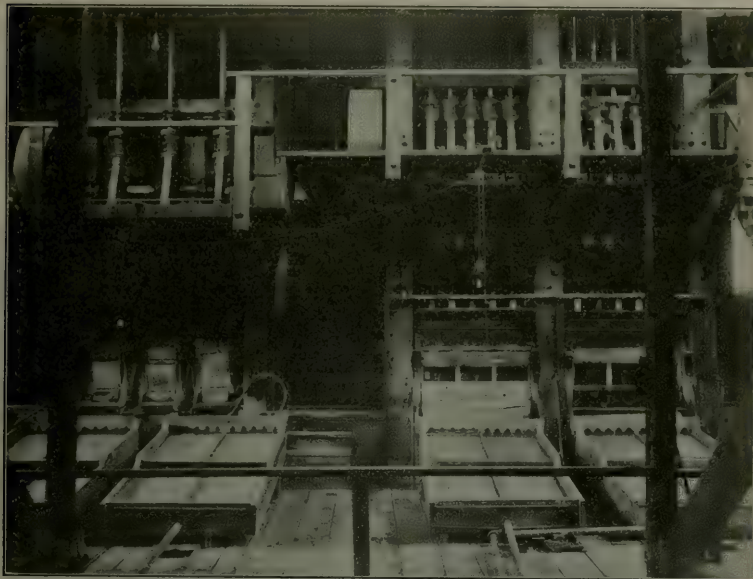


Photo No. 6. Stamp batteries in the old mill of the Curtz Consolidated Mines Co.

below. This mine was believed to be rich in free-milling gold and the stamp mill below was constructed to treat it. The workings are inaccessible and only a little of the ore from the mine can be seen. Some of it sent down to the Panama-Pacific International Exposition assayed over \$100 per ton in gold and silver, amalgamating over \$50 in gold. How the ore averaged is not known by the writer. This mine occurs in the Colorado Hill on its northern side. The ore is largely flint and chalcedony in a softer iron stained clay-like material and the siliceous mass has gray granular silver minerals in it. The ore is amenable to amalgamation and cyanidation.

The Orion Mine has its two tunnels a little distance to the west of the Morning Star and lower down the hillside, the lower one near the floor of the Mogul Cañon. Five hundred or more feet of tunnel were con-

structed and a vertical shaft 110 feet deep. The upper tunnel was 200 feet and the lower 300 feet. It is said a body of ore was struck in lower tunnel some 6 feet wide which assayed \$212 silver, \$25 gold and 50% lead. Ore from the upper tunnel ran 10% copper, \$15 silver and \$5 gold. These figures do not of course represent the average ore. They may be all right for samples.

These four mines of the Curtz Company represent all that has been done in underground work in the district, and this work to a large extent was done from 30 to 50 years ago. The district has been a long time sleeping, but is destined to be awakened suddenly.

Equipment: The Curtz Company owns the old 35-stamp mill on the Carson River which was built to treat the Alpine ore. It is useless as a stamp mill, but could be utilized, if necessary, for the Alpine ore if the tailings were impounded. However, it has been converted into an electric power house and the present equipment can develop 250 h.p., which can be increased to any desired capacity.



Photo No. 7. Curtz Consolidated Mines Co.'s ore dump at Curtz Tunnel, and 50-ton concentrating test plant. Showing south end of outcrop of Morning Star Lode. Georgiana Lode courses toward and cuts out Morning Star Lode at end of outcrop on summit.

The company has recently built a new mill on the hill near the Georgiana tunnel. This is equipped with a Huntington rotary mill capable of crushing 100 tons daily—four concentrators and three slimers. The mill machinery is run by electric power. Water for concentration is conserved in two large tanks and sufficient water can probably be developed on the hill for concentration. The present method of water concentration for this ore is not economical, as less than 60% is saved. Concentration by flotation will have to take its

place and the mill equipped for this method. A boarding house and assay office complete the equipment.

The Hercules Company owns claims situated wholly in the Monitor district. Their mines are the Colorado No. 2 and the Advance, both of which have their adit tunnels near the bottom of the Monitor Creek Cañon. The mines are in the Colorado Hill on its south side and the ore extracted has been largely silver ore.

The old Colorado No. 2 was the best mine of this district and statistics show that it was a good producer. There are two tunnels to this mine



Photo No. 8. End of aerial tramway, Alpine Mine.

connected by a winze. The upper or Tarsus tunnel is 500 feet long and the lower tunnel, the Colorado No. 2, is 1400 feet in length and lies 325 feet below the upper and 600 feet below the surface of the hill. It is said that \$625,000 was taken from this mine in a comparatively short time, the ore averaging \$12 per ton. The ore is also in a siliceous gangue and the outcrop is seen above. It is an ore of mixed sulphides and sometimes lead and zinc are very prominent as sulphides. The rock is mainly low grade, but rich streaks are found which raise the general average. The rich streaks have shown ruby silver, argentite and polybasite or stephanite. According to old reports of this district there were no walls for the ore bodies. It is a case of silicification and impregnation of the rock, and definite walls are not likely to exist.

The Advance tunnel is a few hundred feet west of the Colorado No. 2 and about 100 feet lower. It is headed to connect eventually with the Colorado No. 2 by shaft and also strike the same body of ore



Photo No. 9. Mill of the Hercules Consolidated Mining Co.,
Monitor District, Alpine County.

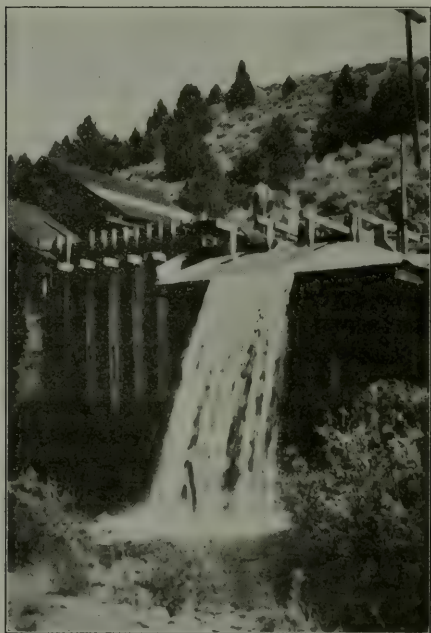


Photo No. 10. Power plant of the Hercules Consolidated
Mining Co.

at a lower depth and the estimated distance still to run is about 300 feet. Some recent mining has been done and the tunnel is now about 2000 feet long. The concentrates of the ore have been shipped by hauling to Minden. The average is low, but streaks of good ore occur. One now in sight is a thin seam of rhodochrosite containing blackish silver minerals. Manganese is a characteristic of the ore bodies in this districts and some of the tunnels have black coatings of the oxide on the walls. The other tunnels in the immediate vicinity are the Lincoln and the Globe. These are owned privately, and no ore has been produced from them for years. The Lincoln is in the Colorado Hill, a short distance west of the Advance and is about 2000 feet long. The Globe is further down the creek and on the south side of the cañon.

The sketch of the claims in the Monitor district shows the position of the principal tunnels.

The Hercules Company has an electric power house on the Carson River about one mile below the Curtz Mill, and it can develop all the power necessary to mine and mill the ore. At the mine there is a 20-stamp mill and 10 Frue vanners run by electric power. These concentrators also are inadequate, not making a clean concentration and probably flotation will have to be introduced. The Monitor Creek furnishes abundant water for concentration. All the mining in the two districts has been done by hand drilling. The cost of mining and milling can be reduced to a very low figure. The bodies of ore are easily reached by comparatively short tunnels from the sides of the hills. Much of the ore is quite friable and easily crushed. Electric power is installed and electric drills can materially increase the daily tonnage of ore extracted. An equipment by either company which would mine and crush from 500 to 1000 tons a day, together with a good concentration process would permit of working with profit a very low grade ore, lower probably than what the average ore of the district yields. There is a haul at present of about twenty-six miles to railroad, but with active mining resumed on a large scale, there are possibilities of the railroad being extended to the districts. Preliminary surveys have already been made for the extension from Minden. Not much can be said of the other mining districts which once had active camps. They are desolate and deserted.

SILVER MOUNTAIN DISTRICT.

This district is about five miles southwest of the Monitor district. The main highway leaves the Carson River and follows up the Silver Creek, passing through the mining district at the base of Silver Mountain. About thirty years ago, Silver Mountain City existed with a population of 4000. The only sign of a former town is the stone wall

of a small jail. This district has the I.X.L., the Exchequer and Pennsylvania mines, and these produced ore once. The principal mines of the district were owned by the **Isabel Mining Company** of London, with Louis Chalmers as mine manager. Judging from the wreckage of old mine buildings, this company must have expended a vast amount of money in experimental plants for treatment of the ore. Roasting plant, amalgamating plant, mill and other buildings have gone to ruin. A tunnel called the Isabella was run into the base of the mountain to strike the body outcropping some 2000 ft. above. The tunnel was made wide with double track after 4400 feet of fruitless tunneling was done. The work was abandoned, as this apparently ended mining in the district. The ore occurs in siliceous bodies in the volcanic andesite. Silver Mountain is a volcanic peak with these same siliceous and mineralized bodies.



Photo No. 11. Dump of the old Isabella Mine, Silver Mountain District, Alpine County.

SILVER KING DISTRICT.

This district lies about fifteen miles south of the Monitor district and is reached by trail through Bagley Valley. In this section the volcanic andesites disappear and are succeeded by granite and metamorphics. Some of the granite ridges are capped with later volcanics. Mining was started in this district, but was not carried very far, as the ore proved too low grade to work in that isolated region.

It seemed to be an auriferous pyrite disseminated in a schist. Work was started here and considerable money spent because assays which were erroneous showed high gold content.

MINERAL WATER.

Grover's Hot Springs, Mrs. H. A. Grover, Markleeville, owner, are about 4 miles west of Markleeville near the southern extension of the Sierra Valley fault, and on the south side of Markleeville Creek. There are 10 or 12 springs and seepages in two marshy areas about 100 yards apart at the edge of a meadow. The temperature ranges from 128° F. to 146°. The place is used as a camping resort, and there is a pool for bathing.

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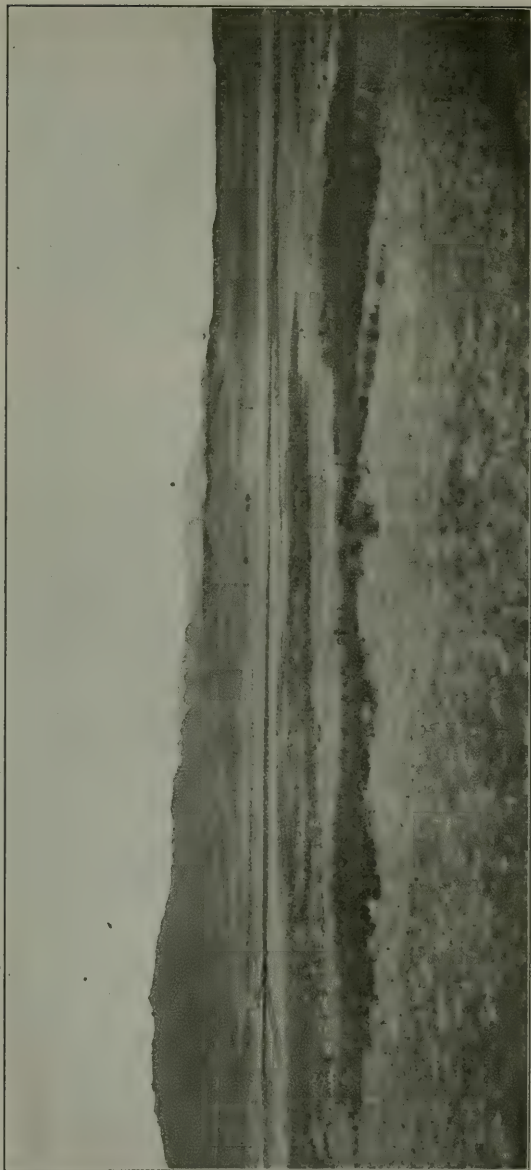


Photo No. 1. "The Desert Rat" or prospector, crossing the Amargosa Valley, Inyo County.

INYO COUNTY.

By CLARENCE A. WARING and EMILE HUGUENIN, Field Assistants.
With Mining and Geologic Reconnaissance Map by CLARENCE A. WARING.

INTRODUCTION.

The field work for this report was carried on during the months of March and April of the year 1916. The expedition made use of a light automobile, which proved a very rapid and efficient instrument for covering the great wastes of desert gravel and sand, as well as the steep mountain roads.

The writers devoted most of their attention to the mines in operation throughout Inyo County, but endeavored to obtain reliable information concerning the many prospects and claims which hold considerable promise. The geologic map is partly a compilation, with additions and alterations introduced from personal observations.

Appreciation is expressed for the uniform courtesy and helpfulness tendered by the owners and operators of the mines.

LOCATION AND DESCRIPTION.

Inyo County lies along the eastern border of California and is bounded on the north and south by Mono and San Bernardino counties respectively. The western boundary extends to the Sierran divide. The county has an area of 10,224 square miles, being the second largest county in California. Independence is the county seat, while Bishop, with about 2000 inhabitants at present, is the center of population. Since the great increase in mining activity during the last year the population has increased considerably, so that at present there is probably an average of one inhabitant to each square mile of territory. Within the borders of the county are both the highest point and the lowest point in the United States. Mount Whitney has an elevation of 14,501 feet, while the lowest point in Death Valley, at Salt Flat, is 280 feet below sea level.

HYDROLOGY.

CLIMATE AND WATER SUPPLY.

The climate of Inyo County is controlled principally by the Sierra Nevada Mountains, which cause the moist, cool winds to precipitate practically all their moisture on the high mountains, or on their west side. The winds are thus dry after they pass the Sierras and tend to absorb moisture from the soil and vegetation of the already desiccated country.



Photo No. 2. Mt. Whitney, the highest point in the United States. Elevation 14,501 feet.
Viewed from Lone Pine, Inyo County.



Photo No. 3. Furnace Creek, or Coleman Ranch and Salt Flat, the lowest point in the United States. Elevation -280 feet. Viewed from the mouth of Furnace Creek.

The average rainfall in the Owens Valley region is between three and four inches, while there is no appreciable rainfall east of the Inyo and White mountains. The melting snows of the Sierras furnish Owens Valley with an abundance of water, but the snowfall on the peaks of the desert region and the slight rainfall usually evaporate without entering the soil and furnish only a temporary water supply to the miners, who must melt the snow over fires, or use the water that accumulates in natural "tanks" or rock bowls. The whole region, however, is subject to electrical storms, which often cause temporary local floods.

Only two rivers receive sufficient water to extend beyond the base of the mountains. The others sink at once into the desert gravels or settle in playas. The water of Owens River is now partially used for the Los Angeles aqueduct and the balance flows southward into Owens Lake, where it evaporates. The Amargosa River rises in springs north of Beatty, Nevada, and flows southward, intermittently, across the Amargosa Desert and through Franklin Lake to Resting Springs Lake. It enters a narrow cañon south of Tecopa, between Black and Kingston mountains, and there spreads out, forming a great dry wash, where it is joined by the South Amargosa, which rises in Silurian Lake. The river takes a broad turn to the westward around the south end of Black Mountain and enters Death Valley flowing northwestward in the region of Saratoga Springs.

The headwaters of the Amargosa are fine fresh water, but it becomes briny with salt, borax and niter in the region of Resting Springs Dry Lake, and leaves salt patches along its course all the way into Death Valley.

Many of the springs are fed, only temporarily, by local precipitation, and dry up during the summer. The main dependable springs, however, such as Furnace Creek and Grapevine Springs, arise along fault lines across Paleozoic rock strata and are fed from great distances by rainfall or snowclad peaks. Although many of the springs, in the valley especially, are highly charged with the sulphates of sodium and magnesium, making them unfit and harmful for drinking purposes, one can probably not go anywhere in the region where he will be over 30 miles from potable water. Boiling of somewhat stagnant water of the springs, kills all minute animal and vegetable life and renders it safe for drinking purposes. It is not only lack of water that is fatal to prospectors in the region, for the intense heat and aridity have exhausted and stifled the life of prospectors when their canteens were full. The temperatures in Death Valley have been known to run as high as 140° F.

On account of the generally poor quality of water in the region, it is well to drink freely at the good springs and very little of the poor spring water. In place of drinking during the day, a small pebble carried

under the tongue creates sufficient irritation to cause a flow of saliva to keep the mouth moist. A generous supply of canned fruit and vegetables among the provisions often furnishes enough solution for the system without much water.

When traveling in the desert, free use should be made of a map and compass, and landmarks noted along the way, which will enable the traveler to locate himself approximately on the map. With the north star at night and the sun in the day one should have no serious trouble in keeping his directions straight. If lost, however, it is best to retrace one's steps or build a signal fire.

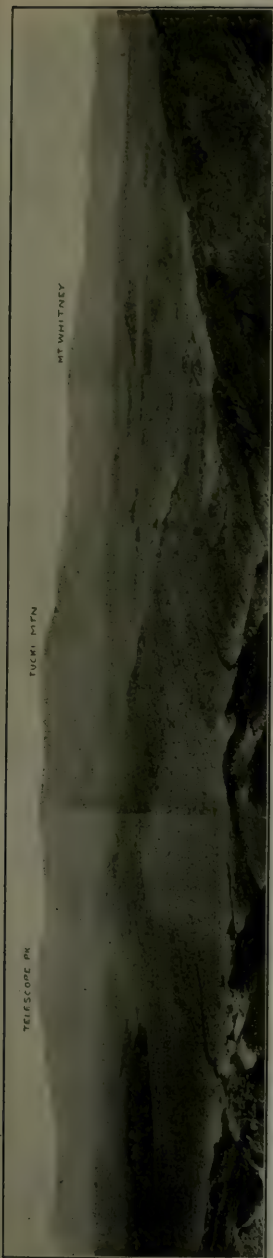


Photo No. 4. View westward from trail to Keane Wonder Mine, showing Keane Wonder camp, Death Valley and Mt. Whitney in distance—lowest and highest points in United States.

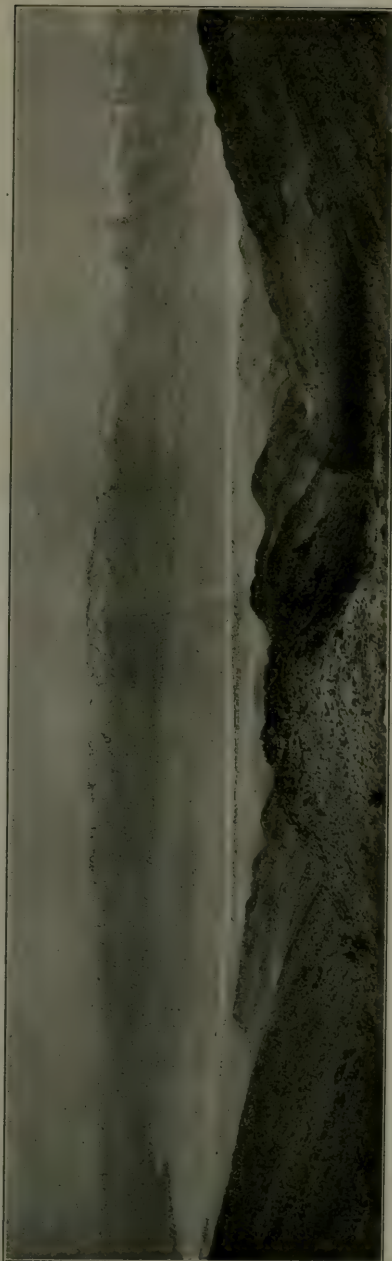


Photo No. 5. Owens Lake, looking southwestward from road south of Cerro Gordo.

WATERING PLACES IN INYO COUNTY.¹

¹The following list of watering places has been compiled from notes taken in the field, together with springs listed by Messrs. W. C. Mendenhall and Gerald A. Waring, in U. S. Geol. Survey Water Supply Papers Nos. 224 and 338. The list has also been reviewed and added to by Mr. A. M. Strong, of Los Angeles, former Inyo County Surveyor.

Name of spring or well	Location	Character and quantity of water
Antelope Springs	SW. edge Deep Springs Valley..	Small; good water.
Arab Spring	See Centennial Springs.	
Argus Spring	8 miles NE. of Darwin on road to Panamint Valley.	Good; small supply.
Barrel Springs	In Mazourka Cañon, 10 miles NE. of Independence.	Good.
Bennett's Wells	20 miles S. of Furnace Creek Ranch, in Death Valley.	Brackish; obscured by sand; tules.
Bird Spring	See Dodd's Spring.	
Black Mountain Springs.....	Several on W. side of Black mountains.	Small seasonal springs.
Borax Well	At old Amargosa borax works, 1 mile SW. of Zabriskie.	Well; flowing water into trough.
Bradbury Spring	10 miles W. of Zabriskie.	Good; supply limited.
Burro Spring	6 miles in air line S. of Tin Mountain.	Good; supplies 3 bbls. a day.
Centennial Springs	9 miles NW. of Coso.....	Plenty of good water.
Cerro Gordo Water Supply.....	Springs 5 miles N. Cerro Gordo.	Small; piped to mine.
China Ranch	See Morrison Ranch.	
Coleman Springs	See Furnace Creek Springs.	
Confidence Springs	7 miles NW. of old mill in S. Death Valley Narrows.	Good; small amount; left hand trail.
Coso Hot Springs.....	15 miles NE. of Little Lake....	Large medicinal hot springs.
Coso Well	At Coso, 8 miles SW. Darwin..	Good water; plenty.
Cottonwood Creek	14 miles NW. of Skidoo.....	Good, clear water; plenty.
Cow Creek	8 miles NE. Furnace Creek Reh.	Good; plenty.
Crystal Springs	4 miles NW. Coso; 2 miles NE. Coso Peak.	Good water. Plenty; piped to Darwin.
Daylight Springs	Head of Boundary Cañon; 8 miles N. of Keane Wonder.	Good water; 8 bbls. per day.
Death Valley Junction.....	On T. & T. R. R., 50 miles S. of Beatty, Nevada.	Good water; pumped.
Deep Springs	S. end of Deep Springs Valley, 18 miles NE. of Alvord.	Plenty of good water.
Dodd's Springs	7 miles S. of Ubehebe Peak.....	Good water; supply limited.
Emigrant Springs	In Emigrant Cañon; 4 miles W. of Skidoo.	Good water in two springs.
Fountain Springs	6 miles N. Furnace Creek Ranch	Fair water; small quantity.
Franklin Well	10 miles N. Death Valley Jct....	Fair water; old well seldom used.
Furnace Creek Springs.....	E. edge of Death Valley, near mouth of Furnace Creek.	Good water; large quantity.
Goldbelt Spring	9 miles SE. of Ubehebe Peak...	Good water; 20 bbls. per day.
Grapevine Springs	E. side Death Valley; 3 miles W. of Staininger's Ranch.	Good; large supply from bench.
Greenwater Spring	3 miles SE. of Greenwater.....	Fair; small supply.
Haiwee Springs	3 miles N. of Coso Hot Springs.	Large supply of good water.
Hole in the Rock Spring.....	In Boundary Cañon; 5 miles NW. of Keane Wonder.	Good water; small seep in a hole.
Homestead Cañon	NW. edge of Saline Valley.....	Good supply.
Hot Springs	3 miles SE. of Zabriskie.....	Used for bathing and railroad.
Hunter and Keynot Cañons.....	E. face of Examiner Peak, W. of Saline Valley.	Good supply; used for mine and mills.
Indian Springs	W. edge of Death Valley; NW. of Mesquite Flat.	Fair; uncertain quantity.
Junetion Springs	15 miles S. of Darwin.....	Good supply; piped to ranch.
Keane Spring	4 miles NW. of Chloride Cliff..	Good water; 30 bbls. per day.
Jane Pump	See Willow Springs.	
Lead Cañon	NW. edge of Saline Valley.....	Good supply.
Mesquite Well	On SW. edge of Mesquite Flat; often obscured by sand.	Fair; uncertain quantity.
Mesquite Spring	In Death Valley wash; 6 miles SW. of Staininger's Ranch.	Fair; uncertain quantity.

Watering Places in Inyo County—Continued.

Name of spring or well	Location	Character and quantity of water
Morrison Ranch	4 miles SE. of Tecopa.....	Excellent water; large supply.
Mountain Spring	W. slope Argus Range; 20 miles E. of Little Lake.	Good water; plenty.
Oasis (Mono County).....	30 miles NE. of Alvord Station Big Pine.	Springs and wells; good; plenty.
Owens Lake Springs.....	Scattered along SE. edge of Owens Lake.	Brackish but usable; plenty.
Poison Spring	11 miles NE. Furnace Creek Ranch.	Poor, but usable in small quantities; seep; dangerous.
Rest Spring	7½ miles in airline S. of Tin Mountain.	Good; supplies 3 bbls. daily.
Resting Springs	5 miles NE. of Tecopa.....	Upper springs good for drinking.
Ring or Ruiz Well.....	On Mesquite Flat, 2 miles SW. of Surveyor's Well.	Brackish water; 4-foot well often obscured by sand.
Rose Spring	2½ miles S. of Lower Haiwee Dam, ¼ mile W. of road.	Small; little used.
Saline Valley Springs.....	1 mile W. of Salt Lake, Saline Valley.	Fair quality; good supply.
Salt Creek Wells.....	Near Salt Creek, 6 miles SE. of Stovepipe Wells.	Brackish water; 2 shallow wells.
Salt Well	N. end Salt Flat, Death Valley.	Very salt; used for stock only.
Sand Springs	In N. end of Lost or Death Valley; mouth of Tule Cañon.	Strong sulphur.
Skidoo Water	Pipeline from Telescope Peak to Skidoo, via Harrisburg.	Excellent snow water from Telescope Peak.
Staininger's Ranch	In Grapevine Cañon; 12 miles NE. of Tin Mountain.	Excellent water; large supply.
Stovepipe Wells	SE. edge of Mesquite Flat.....	Brackish water; two 5-foot wells; large supply.
Surveyor's Well	NE. corner of Mesquite Flat....	Good water; 5-foot well; camp.
Tecopa Well	At old smelter, 8 miles SE. of Tecopa.	Excellent water; plenty.
The Tanks	6 miles N. of Trona on Searles Lake.	Good water piped from tunnel near mouth of Argus Cañon.
Toll House Spring.....	12 miles E. of Big Pine on road to Deep Springs Valley.	Small; used for watering stock.
Triangle Spring	3 miles SE. Surveyor's Well....	Good water; small quantity.
Tule Spring No. 1.....	1½ miles SE. of Thimble Peak, 10 miles NW. Keane Wonder.	Good water; limited supply.
Tule Spring No. 2.....	3 miles NE. of Tecopa.....	Fair; 2 barrels daily.
Tule Springs	15 miles S. of Furnace Creek Ranch, Death Valley.	Brackish water; small supply.
Warm Spring	On NE. edge of Saline Valley....	Plenty of good water.
Waucoba Springs	On road to Saline Valley, 25 miles N. of Salt Works.	Small; used for watering stock.
Wildrose Spring	In Wildrose Cañon, on road to Skidoo.	Excellent water; large flow.
Wildrose Spring No. 1.....	At antimony mine camp, Wildrose Cañon.	Good water; large flow.
Willow Spring	3 miles E. Thimble Peak; 10 miles N. Keane Wonder.	Good water; 10 bbls. daily.
Willow Springs	4 miles NE. of Darwin in Darwin Cañon, at Lane Pump.	Excellent water; plenty.

On the east side of Death Valley several springs, such as those at Furnace Creek and the Grapevine Springs, arise along faults and furnish a constant water supply. On the west side of Death Valley, water is found at Blackwater Spring, Death Valley Cañon, Hanaupah Cañon, Hungry Bill's Ranch, Arrastra Springs and Anvil Springs.



Photo No. 6. Town of Keeler and Owens Lake. Mt. Whitney range in the distance.



In the Panamint Valley Drainage all the large cañons on both sides contain springs or small living streams. On the east side from north to south these are Mysterious Cañon, Wildrose Cañon, Tuber Cañon, Jail Cañon, Hall Cañon, Surprise Cañon, Pleasant Cañon, Middle Park Cañon and South Park Cañon. On the west side from north to south they are Mill Creek, Darwin Wash, Modoc Cañon, Snow Cañon, Wood Cañon, Knights Cañon, Revenue Cañon, Shepherd Cañon and Water Cañon.

In the Searles Lake Drainage there are a number of small springs on the west side which are used as a water supply for the works at Trona. These are designated by the names of the cañons in which they occur as follows: Bruce Cañon, Parson's Cañon, Argus Cañon and Joe Peterson's Cañon, respectively 10, 8, 6 and 4 miles north of Trona. Most of these springs are connected with the water system and furnish about 15 miners inches.

In the extreme southeast portion of the county there are some wells and springs along the Amargosa River and in the Kingston Mountains.



Photo No. 8. Emigrant Spring, in Emigrant Cañon, on road from Mesquite Flat to Harrisburg, Inyo County.



Photo No. 9. A Sunday bath at the old Amargosa Borax Works well, south of Zabriskie, Inyo County.

TOPOGRAPHY AND DRAINAGE.

The main mountain ranges of Inyo County, without exception, run in a northwest-southeast direction, parallel to the Sierra Nevadas. From west to east the series of elevations and depressions is as follows: Sierra Nevada Mountains; Owens Valley; White and Inyo mountains with the Argus Range; Eureka, Saline and Panamint valleys; Panamint Range; Death Valley; Amargosa Range; Amargosa Valley and Nopah Range.

Owens River empties into Owens Lake, which at one time no doubt overflowed southward past Little Lake and through China Lake and



Photo No. 10. View of Silver Lake, San Bernardino County, after the flood by the Mojave River, January, 1916. The water tank to the extreme right marks the old location of the depot and townsite.

Salt Wells Valley into Searles Lake. These latter lakes are at present dry and receive only a slight drainage from their surrounding mountain ranges during occasional desert storms.

The Panamint Valley is the settling basin for any waters falling on the west slope of the Panamint Range and the eastern slopes of the Argus and Slate ranges.

Death Valley receives all drainage from the Amargosa River and may, at times, have received waters from the Mojave River. During the winter of 1915-1916 waters from Mojave River flooded the town and railroad at Silver Lake, and a rise of a few feet in the water level would have carried water into Silurian Lake and into Death Valley.

The mountain ranges as a rule are steep and rugged, due to the desert erosion of the hard metamorphic strata and volcanic rocks, and to faulting. The bases of the mountain ranges are well defined, and long gentle slopes of wash gravels and sands extend, often for miles, to the rims of the flat alluvial settling basins.

CULTURE.

MODE OF TRAVEL AND ROUTE.

The expedition which sought information for this report, started from San Francisco on March 8, 1916, and entered the county at Tecopa, by way of Fresno, Bakersfield, Mojave, Atolia, Pilot Peak and Riggs. Death Valley was crossed from Owl Hole to Saratoga Springs. From Saratoga Springs, Tecopa is accessible by machine by way of the Ibex mine and Zabriskie. A blind road following around the eastern side of the hills north of Saratoga Springs escapes the dune sand encountered on the west side road to the Ibex. The sand and gravel of the Amargosa Valley east of Saratoga Springs is very deep, and the road from Riggs to Tecopa along the Tonopah and Tidewater railroad is impassable by machine.

From Tecopa the lead-silver mines in the Nopah Range were visited. From Zabriskie side trips were made to the Ibex, Carbonate and Golden Treasure mines, and then to the old Greenwater camp and the borax works at Death Valley Junction, with quarries at Ryan. Death Valley was again entered by way of Furnace Creek, and the road along the east side of the valley was followed to the Keane Wonder mine. A good road from Keane Wonder to Beatty, Nevada, was found and followed northward to Bonnie Claire, from which place a tractor road was followed into the Ubehebe district. On the return to Beatty, a trip was made to Chloride Cliff and then a crossing of Death Valley made up the Salt Creek road, along the south end of Mesquite Flat and southward up Emigrant Wash, to the old Harrisburg camp. After visiting Skidoo, the region about Ballarat and the Slate Range, north of Trona, was covered and a return made to Wildrose Cañon and across the north

end of Panamint Valley to Darwin. From Darwin, trips were made into the Coso region and on to Keeler and Cerro Gordo. Owens Valley was worked from Lone Pine to Bishop, and side trips were made into the Inyo and Deep Springs mountains, and Round Valley. The return to San Francisco was made by way of Little Lake, Mojave, Los Angeles, Tejon Pass, Bakersfield and Fresno. About 2700 miles were traveled during the ten weeks spent in the field.

HINTS FOR TRAVELERS IN MACHINES.

Since so much prospecting is now being done in automobiles, it is deemed fitting to include a few suggestions which may be of help in desert regions.

The best months for traveling in eastern Inyo County are from March to June, inclusive. During the summer months the heat is intense, water scarce and the sands dry and loose. The winter months are very cold and storms sudden and severe, but the sands are often moist, or wet, and hard. When traveling, even in a light machine, one should have a helper, and carry extra water, gasoline, oil, casings and inner tubes. For the tool kit, a small shovel and a set of differential pulleys, such as the "Pull-U-Out," is often a "life-saver" when attached to a "dead-man" or plank 2"x 6"x 5' long, buried in a trench 2 feet deep. For deep sand or gravel, soft or deflated tires often enable the machine to pull through, or twigs of brush laid across the sand to corduroy the road are often essential. When the machine is stuck in the sand, it may be cranked out, if the spark plugs are removed to relieve the cylinder compression, and the low gear used.

Water, Gas and Oil. While covering this territory, the writers found that a 5-gallon can each of gasoline and water, a 5-gallon and a



Photo No. 11. A corduroyed road. Mesquite Flat, Death Valley.



Photo No. 12. Using a "Pull-U-Out" attached to a "deadman," Amargosa Flat, near Saratoga Springs, Death Valley.

2-gallon desert water bag, and 6 quarts of lubricating oil were not too much for the necessarily long runs between supply stations in the Death Valley region, especially since several side trips had to be made.

Water. Good water should be obtained at Mojave, Granite Wells at Pilot Knob, Furnace Creek Ranch, Keane Spring, Daylight Spring (on the road from Keane Wonder to Rhyolite), Harrisburg (from the Skidoo pipeline), Skidoo, Wildrose, The Tanks (north of Searles Lake), Darwin and in Owens Valley. The water at Owl Hole Spring is very alkaline and that at Saratoga Springs, Tecopa, Zabriskie, Death Valley Junction and Stovepipe well only less so.

Gas and Oil. Gasoline and oil are very high-priced in the eastern part of the county but may be purchased at Mojave, Atolia, Tecopa, Zabriskie, Death Valley Junction, Beatty (Nevada), Trona (San Bernardino County), Darwin, Keeler and any of the towns in the Owens Valley. In some cases it may be necessary to use distillate, which can often be purchased from those operating motor trucks or tractors at Riggs, Zabriskie and Bonnie Claire.

Outfit. It is always well to carry provisions enough for a few days longer than it is expected the trip will take. A folding canvas bucket, fry pan, long-handled 2-quart stew kettle, can opener and paper towels are all the cooking utensils needed. The eating utensils should include plates, saucers, cups, knives, forks, table and teaspoons. A convenient table can be made of cushions or suitcases set on boxes or boulders. Warm sleeping bags made of a double thickness of all wool comforters and sheet, inclosed in canvas, or their equivalent, should be

provided. Linen mesh or other good absorbent underwear, with both thin and wool shirts and both khaki and wool suits, and an overcoat, should be provided for the extremes of temperature from day to night and extremes of elevation from 250 feet below sea level, in Death Valley, to 9000 feet above at Cerro Gordo. A panama hat or other similar shape, with shading and light weight qualities, furnishes good protection. Ordinary heavy top shoes are sufficient, unless considerable walking on side trips is to be done, when hob-nailed top boots should be used. A large sheet of khaki canvas 9' x 16' is very useful for machine cover or to spread on the sand under beds.

Provisions. Along the principal routes of travel at railway and stage stops and at the larger mines, eating and lodging can usually be obtained. In desert travel, away from these scattered points, a supply of provisions should be taken sufficient for the entire journey. Where a machine is used, canned goods are not burdensome and are quickly prepared, and provide an excellent variety. A varietal selection from the following list will be found satisfactory, allowing for a hearty meal at night and a lunch at noon:

Meats, etc.	Cereals	Vegetables	Fruits	Miscellaneous
Bacon. Eggs. Canned tuna. Canned tongue. Canned roast beef. Canned corned beef. Canned oysters. Canned milk.	Grapenuts. Corn flakes. Cream of wheat. Germea. Rolled oats. Flap jack flour.	Potatoes for baking in fire. Onions for baking in fire. Baked beans. Canned asparagus. Canned spinach. Canned string-beans. Canned tomatoes.	Apples. Oranges. Lemons. Canned pears. Canned peaches. Canned apricots. Canned cherries. Crabapple jelly. Maple syrup. Grape juice.	Wrapped bread. Soda crackers. Sweet cookies. Coffee. Tea. Sugar Salt. Matches.

Fuel. The roots of dead sagebrush, often partially buried in sand, usually furnish sufficient fuel for camp fires, but a small "sterno," or "Canned Heat" outfit, is very compact and convenient for a quick lunch. Vacuum bottles are also great time savers for hot lunches.

Roads and Routes. The map accompanying this report shows the main roads and thoroughfares. As a rule, the roads in the west side of the county are fairly well kept up, while practically no work at all is done on roads in the eastern part of the county. Where mines are working, the necessary road work to get to and from the mines is done by the owners or operators of those mines. In most cases only a small amount of work is necessary to make the desert roads passable, but a freshet may undo the results of the labor in a very few hours. In a county so large, it could hardly be expected to keep all the roads up, but there seems no legitimate reason for not keeping at least four good thoroughfares open across the county, especially since it would be the best means

of fostering the mining industry, which is the sole industrial hope of all the region east of Owens Valley. Furthermore, such thoroughfares should be provided with water stations, which could be done by cleaning out or developing existing springs along the routes.

At present two routes are open:

1. The Midland Trail, or Deep Spring Valley Toll Road, starts from Big Pine and Alvord and passes through Payson Cañon, Deep Spring Valley, Oasis, Palmetto and Lida, to Goldfield.

2. Another leaves the main Owens Valley Midland Trail at Lone Pine and passes through Swansea, Keeler and Darwin, and thence northeastward over a 20% grade in the Argus Range and down into Panamint Valley, thence up Wildrose Cañon to Harrisburg, and down the long, deep gravelly Emigrant Wash and across the sandy Mesquite Flat and Salt Creek into Death Valley, thence up Keane Wonder Wash, where a good road is found leading from the Keane Wonder Mine to Rhyolite, Nevada.

Both these routes could be kept easily passable with a reasonable amount of work and the lowering of a few grades.

Two other routes could be opened up with a few connecting roads:

1. The Big Pine and Saline Valley road leaves Big Pine and Alvord and passes up Waucoba Cañon and down Marble Cañon to Saline Valley. This road is hardly passable between Marble Cañon and Saline Valley, and has *no* connection with the Ubehebe road past Ubehebe Peak, Tin Mountain and Staininger's Ranch to Bonnie Claire, Nevada. Were the two roads connected and kept in repair, many of the mines might be opened up and made producers by interested capital. The Waucoba Cañon-Eureka Valley road is open only as far as the Loretto Mine. This road, with a small amount of work, could be made passable to Palmetto, by way of Willow Creek.

2. The Darwin-Ballarat road, by way of Shepherd Cañon and south from Ballarat through Wingate Pass to Death Valley, where it connects with the road past Bradbury Spring to Zabriskie. The grade through Shepherd Cañon was impassable in the spring of 1916, but this route, with proper attention, should offer additional inducements to the opening up of many mines which are dependent on transportation facilities.

Railroads. As yet Inyo County is only partially served by railroads. The Southern Pacific company has a broad-gauge line from Mojave to Owenyo, where it connects with their narrow-gauge line from Keeler to Tonopah Junction, Nevada. The latter should be broad-gauged to reduce freight rates. This line serves the Owens Valley, and with a branch from Searles to Trona, serves fairly the Panamint Valley. With a spur from a few miles northeast of Spangler, San Bernardino County, around the south end of Slate Range into Panamint Valley, a very rich district would be quickly opened up.

The Tonopah and Tidewater railroad, which follows the Amargosa River through the extreme eastern part of the county, serves with spur tracks the Tecopa lead-silver mines and the Furnace Creek borax mines. A proposed spur track from Valjean, to tap the nitrate deposits in the region of Saratoga Springs, is a move in the right direction to get a railroad on into Death Valley, to make accessible and economically valuable the many gold, silver, lead, manganese, gypsum and borax deposits lying idle in the immediate vicinity.

VEGETATION.

In the well-watered Sierran foothills, on the west side of Owens Valley, willows and locust trees thrive, and fruit trees, such as stand the extremes of heat and cold, do fairly well. Alfalfa grows rapidly, and stock raising is becoming an industry of considerable proportions. Piñon pine and juniper trees are found above the dry timber line, on the mountains, even in the arid eastern part of the county, and furnish fuel and timber for the mines. The piñon cones bear excellent nuts, which are gathered in the fall by the Indians for winter food.

Desert yuccas, or "Joshua trees," are abundant in the upper alluvial wash slopes, and their trunks are used in many mines for light timbering and logging. Barrel cactus, the prickly pear and several branching cacti are usually associated.

Mesquite grows usually in the well-watered sandy flats and furnishes good shade. Sagebrush usually covers the dry mountain slopes and flats, while creosote brush and desert holly occupy the lower alluvial slopes. In the spring months from March to July, California wild flowers are quite abundant on the slopes and washes. Among those noticed in April and May, in all the mountain ranges east of Owens Valley, were the evening yellow primrose, blue larkspur, yellow dandelion, pink and white geranium, yellow poppy, sage, sunflower, purple asters and heliotrope, cream cup, bluebirds' eyes, baby blue eyes, yellow marianas, white forget-me-nots, fringed white gilia, false mallow, yellow and white daisies and yellow buttercups.

Green spots about the springs are usually marked by cottonwood, willow, oak, wild rose, cane, grasses or berry vines. Forage grasses are usually to be found on the upper alluvial slopes.

ANIMAL LIFE.

Native wild mountain sheep roam the Inyo, Panamint and Amargosa ranges. Coyotes and jack rabbits are found on the plains. A few cottontail rabbits and birds are usually found near the springs. Prairie dogs and lizards are abundant everywhere, with but few rattlesnakes. Chuckawallas are abundant on the rocky slopes. Ants, scorpions and tarantulas are common. Mosquitoes are found near the water holes and in the vicinity of melting snows.



Photo No. 13. Chuckawalla at Chloride Cliff. An inhabitant of rocky places.

GENERAL GEOLOGY AND HISTORY.

DISTRIBUTION OF IGNEOUS AND SEDIMENTARY ROCKS.

The entire western side of the county presents the steep eastern slope of the Sierra Nevada mountains (see photo No. 7), which are made up of granite. This rock also forms the backbone of the Inyo and White mountains and of the Panamint Range.

East of Owens Valley, old Paleozoic metamorphic sediments, consisting of limestones, quartzites and schists make up most of the mountain

ranges. These are badly folded and faulted, due principally to granitic intrusions.

Overlying the Paleozoic metamorphics of the Inyo Mountains, in places, are an unconformable series of Mesozoic metamorphic rocks, consisting of crystalline limestone, and slates which in places are fossiliferous.



Photo No. 14. Late Tertiary cinder cone north of Tin Mountain, Inyo County, which has broken through Miocene-Pliocene sandstones and covered them with loose volcanic material.

The post-Jurassic (middle Mesozoic) uplift in this region was accompanied by granitic intrusions and the great fault along the east face of the Sierras; also by mountain-making to the eastward, at which time, or following, the Inyo-White, Panamint and Amargosa mountain ranges were formed more or less parallel to the fault line.

Intrusions of porphyry and diorite followed, with outbursts of rhyolite, andesite and basalt. A large area of volcanism was formed in the Coso Mountains, and lava broke out along fractures on both sides of Death Valley and eastward. Molten rock also flowed from the main fault along the Sierras, eastward across Owens Valley south of Big Pine and north of Bishop.

In the meantime early Tertiary sediments were being deposited in the Death Valley region, and Saline deposits were forming from the evaporating sea water.



Photo No. 15. View eastward from Shoshone, across Amargosa Valley, showing old Cambrian metamorphics in the background and terraces of Pleistocene gravels and clays, largely volcanic material, in the foreground.

Smaller uplifts and earth movements took place during the readjustment of the cooling mass, and Pleistocene lake deposits were laid down in several of the large inclosed basins, such as in the lower Amargosa and Waucoba cañons.

Slight elevations since have been recorded by terraces, and the lowering of the elevation at which the recent sediments are now being deposited.

FOLDING AND FAULTING.

The Paleozoic and Mesozoic metamorphic strata are everywhere intensely folded and fractured, and displacements of several feet are common. Faults have had a great deal to do with the formation of ore bodies since they have provided fissures for the deposition and migration of mineral bearing solutions; not only that, but they have in places cut

off ore bodies and so displaced them that it makes the mining industry one which has need for scientific investigation and help by the geologist. Since all the mines east of the Owens Valley are dry, the ores have been oxidized to great depth, and no sulphide enrichment has apparently taken place. On the other hand enrichment has taken place rather from an oxidation and leaching process which has slowly broken down the sulphides. The Tertiary strata are as a rule gently folded, except in areas where they have been intruded by later volcanic rocks. The Pleistocene sediments are practically horizontal and occur as terraces along the rims of the older strata.



Photo No. 16. Folded borax beds at Biddy McCarty Mine, south of Ryan, Inyo County, capped by late Tertiary volcanic rock.

EROSION.

The hard granite and metamorphic rocks resist desert erosion to such an extent that they stand out, as a rule, and present very steep, rugged surfaces. Where faulting and fracturing has occurred, it permits of the loosening of large angular rock fragments, which are easily picked up by the torrential storms and carried down into the lowlands. The finest sediments are carried down in suspension, by the water, to fill the low basins, where they are deposited as mud, often over large areas. The "Racetrack," (see Photo No. 18), in the Ubehebe district, is an example of the latter process, which has formed a large level mud-flat about a grandstand of granite. This track was used by the Indians for horse races, and during the Greenwater "boom" was used for automobile races.



Photo No. 17. View eastward of Mormon Point, Death Valley, showing alluvial cones built up of rock fragments, brought down from the hard Cambrian metamorphic rocks by torrential waters.



Photo No. 18. "The Racetrack," Ubehebe district, Inyo County: View northeastward towards Tin Mountain, Panamint Range.

In the regions of Miocene-Pliocene and Pleistocene sediments and volcanics, erosion is much more rapid, and the cañons present almost vertical faces of only partly consolidated material.

Windstorms (see photo No. 20) are a common and characteristic occurrence in the desert. They are severe and often last for several days, carrying sands and loose material for thousands of feet into the air and often depositing it miles away. Bushes and brush (see photo No. 23) tend to hold the sand and prevent its shifting, often causing the sand to pile up several feet high, as on Mesquite Flat, Death Valley.

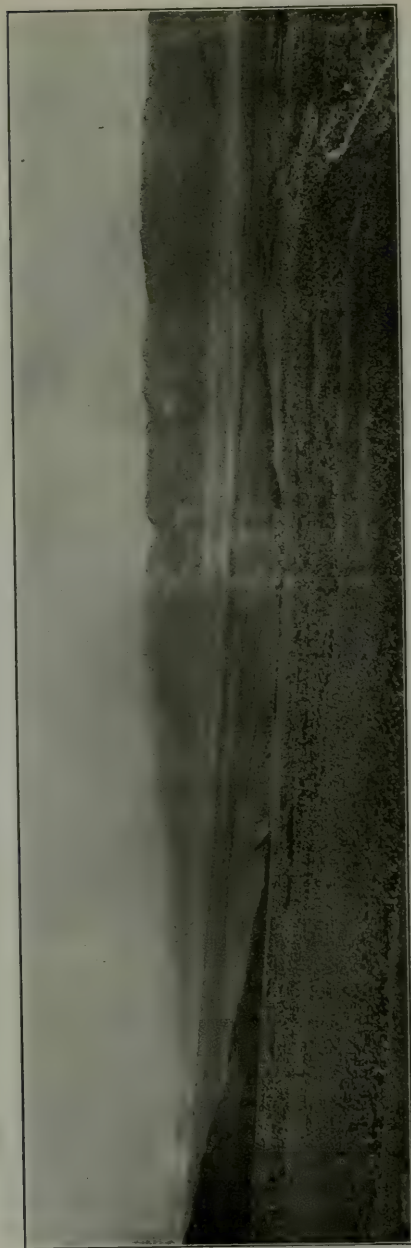


Photo No. 19. View of Death Valley and Black Mountains from the Carbonate Mine. Part of lowest land in United States. Note the long gentle alluvial slope to the left.



Photo No. 20. Wind storm carrying sands from Searles Lake northeastward into the Slate Range, Inyo County.

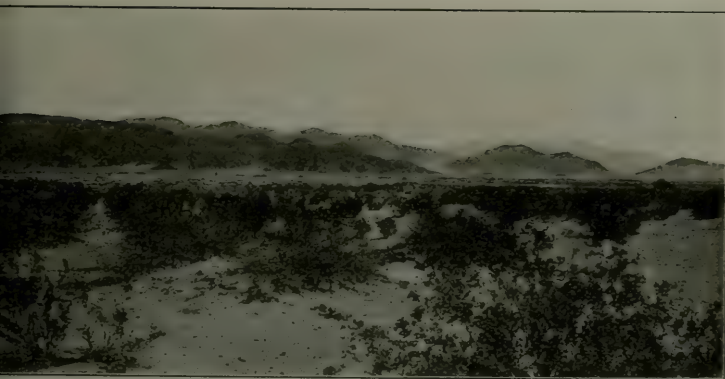


Photo No. 21. View eastward, across Death Valley, towards Saratoga Springs, showing wind-blown sands, which fill the valleys along the west slope of the Black Mountains.



Photo No. 22. View northward of Mesquite Flat. Grapevine Mountains in the distance.



Photo No. 23. Mesquite Flat, Death Valley, showing character of wind-blown sands and the influence of mesquite bushes in preventing their drifting.

GEOLOGICAL FORMATIONS MAPPED.

CAMBRIAN SYSTEM.

The oldest rocks known to be exposed in the county are the Cambrian metamorphics, which have been altered and fractured by the underlying granite. They are found in all the main mountain ranges east of Owens Valley.

The basal member consists of highly folded and contorted limestone and slate which are overlain conformably by a considerable thickness of bluish dolomite marble. This marble was found to contain unidentifiable circular fossil remains, where exposed in the Estelle tunnel and at the Santa Rosa mine in the Inyo Range. Massive limestone overlies the marble and in places is perhaps over 2000 feet thick. A fine-grained dark quartzite overlies the limestone and is interstratified with slate and argillaceous material. These are overlain by from 2000 to 3000 feet of coral limestone and shale. Sandstones and slates complete the series. Arenaceous limestones of these upper beds carry *trilobites* in places.

The following fossil localities are reported² by Mr. R. B. Rowe of the U. S. Geol. Survey to have yielded Cambrian fossils:

1. Three and one-half miles east of Twelve Mile Springs. *Trilobites* of Trenton or Lower Cambrian.
2. Seven miles east of Resting Springs, 1500' from the top of a 4000' section of Lower Cambrian. The trilobite *Hypolithes* and a brachiopod were found.
3. In the pass east of Resting Springs. Cambrian fossils 800' beneath dark blue limestone.
4. On the road from Pahrump Ranch to Furnace Creek along the north edge of Kingston Range. Lower Cambrian fossils from gray shaly sandstone.

SILURIAN.

Silurian metamorphic limestones and quartzites overlie the Cambrian in portions of the Inyo, Panamint and Grapevine mountains. In the Grapevine Mountains they have been mapped by Ball³ as the Ordovician, or Lower Silurian, and the Upper Silurian. The Lower Silurian consists of 2700' \pm of banded Pogonip limestone overlain by a considerable thickness of Eureka quartzite. An unconformity separates these from the Upper Silurian, Lone Mountain gray limestone, which is about 400' thick in the Amargosa Range.

In Mazourka cañon, on the west flank of the Inyo Range, the Ordovician is well exposed. The lower beds consist of 3600' \pm of heavy bedded limestone, while above are 800' of quartzitic shale, and limestone

²U. S. Geol. Surv., Bull. 208, pp. 196-198, 1903.

³U. S. Geol. Surv., Bull. 308.

which is, in places, fossiliferous. On the east flank of the Inyo Mountains these strata are intensely folded, faulted and brecciated.

DEVONIAN.

The Devonian metamorphics lie unconformably on the Silurian, and their basal member is a conglomerate. On the west flank of the Inyo Mountains, between Citrus and Aberdeen, the formation consists of about 1400' \pm of impure limestone, which is cherty in part and in places carries fossils. Considerable Devonian may be included in the area east of Pyramid Peak, northwest of Death Valley Junction, mapped as Silurian.

CARBONIFEROUS.

The Carboniferous is exposed along the southwestern part of the Inyo Mountains, where sections have shown it to be 3000' thick. It rests with angular accordance with the underlying Devonian, but a basal conglomerate suggests a slight unconformity. The strata consist of a succession of heavy bedded limestone and about 2000' of interbedded limestones and slates, which weather in brilliant tints and in places carry *Fusulina*. A massive conglomerate made up of chert fragments usually caps the formation. Considerable Carboniferous may be included in the area east of Pyramid Peak, northwest of Death Valley Junction, mapped as Silurian.

TRIASSIC.

Lower or Middle Triassic metamorphics are exposed along the southwest flank of the Inyo Mountains from the Reward Mine southward to Swansea. They consist of about 5000 feet of thin bedded limestone and calcareous slates, together with some hard, massive, black shales. The strata weather to brilliant tints, buff and terra cotta prevailing. They lie in apparent conformity with the Carboniferous, save where brought into contact by faulting.

The following localities are reported⁴ by Dr. Jas. P. Smith to have yielded Triassic fossils:

1. Lower Triassic in the Inyo Range on the east side of Owens Valley, $1\frac{1}{2}$ miles east of the Union Spring near the McAbey trail over the Union Wash leading into Saline Valley. The locality is 3 miles east of Skinner's Ranch and 15 miles SE. of Independence. Fossils occur in gray limestone not over 12 feet thick that outcrops on the south side of the cañon near the trail.

2. Middle Triassic in the same region as locality 1 is one mile east of Union Spring on the south side of McAbey trail leading over Union Wash to Saline Valley. Fossils occur in a bed of dark limestone not over 4' thick and 800' stratigraphically above the stratum of fossil

⁴U. S. Geol. Survey, Prof. Paper No. 40, p. 20, 1905.

bearing Lower Triassic. The calcareous shales in which the fossil bearing limestone occurs are apparently conformable with the Lower Triassic beds.

MIOCENE-PLIOCENE.

Lake beds, bordering the Black and Funeral mountains, carrying colemanite in places, are thought to be of Miocene-Pliocene age. They consist of over 1,000 feet of white, yellow and green consolidated clays, friable sandstones, with ironstone concretions, rounded and subangular gravels and thin limestone lenses.

The nitrate bearing beds south of Tecopa, in the Owl Mountains, and along the east side of the narrows of Death Valley, near the old Confidence Mine, are thought to be of Pliocene age. They consist of 800' \pm of soft clays of a creamy, yellow color.

QUATERNARY.

The gently tilted conglomeratic beds in the region of Shoshone, in the Amargosa River valley; on the west side of the Coso Range and south of Owens Lake; and in the Waucoba Cañon, east of Big Pine, are believed to be Pleistocene lake beds. They consist of up to 150 feet of sands, conglomerate and agglomerate, or volcanic materials.

Recent gravels and sands make up the washes, while the finer sediment settles in the basins and many undrained valleys. Recent sedimentation in places is over 1000 feet deep.

IGNEOUS ROCKS.

Granitic rocks form the cores of most of the mountain ranges, where they were intruded during the post-Jurassic, or Sierran, uplift. These intrusions were followed by magmatic segregations and intrusions of porphyritic and quartzitic rocks.

During Tertiary sedimentation volcanic rocks were exuded and cover large areas in the Black Mountains, Coso Range and the tableland north of Bishop.

ECONOMIC GEOLOGY.

During the year 1915, the following minerals were being produced in Inyo County: antimony, borax, copper, dolomite, gold, gypsum, lead, marble, pumice, silver, zinc, salt, soda, talc, and tungsten. Deposits of iron, molybdenum, niter, potash, quicksilver, and silica also occur but have not as yet been developed.

The following table shows the mineral production from the year 1880 to 1915, inclusive, and the development of the mining industry.

HISTORY OF MINING DEVELOPMENT.

Mining began in 1861 with the establishment of the Russ mining district east of Independence. There was considerable activity from 1869-1877, when the Cerro Gordo and Darwin districts yielded base bullion. The Southern Pacific narrow-gauge railroad to Keeler, from

Nevada, stimulated the industry somewhat, but the low price of silver did not encourage the industry. In 1907 a revival of interest took place when the footwalls of the old Cerro Gordo mine were found to carry large amounts of zinc. The industry has increased steadily since, and the call for minerals during the European war has stimulated prospecting and the opening up of many old mines. Never was the industry in a more prosperous condition than at present.

ECONOMIC CONDITIONS.

TRANSPORTATION.

Mines located in the region of Owens and Amargosa valleys are easily accessible from the Southern Pacific and Tonopah and Tidewater railroads. Roads and trails make the interior of the county accessible, but hauling is difficult because of steep grades and deep sands.

POWER.

Electric power, generated in the Sierras west of Bishop, is available in the northern and western parts of the county. The eastern, southeastern and central portions of the county are dependent on internal combustion engines, and these are often prohibitive because of high freight rates.

Two companies at present have hydroelectric plants on Bishop Creek. The Nevada-California Power Co., owning three plants, confines its

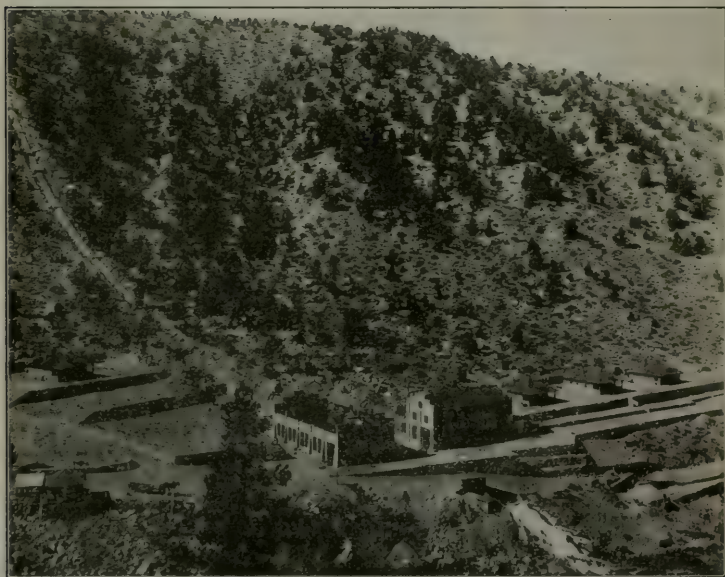


Photo No. 24. View of Power Station No. 2 and pipe line of the Nevada-California Power Co., on Bishop Creek, Inyo County. Generates 6000 k.w. Courtesy of Mr. P. R. Ferguson.

INYO COUNTY—Table of Mineral Production (by year) 1880-1915.

Year	Gold value	Silver value	Lead		Copper		Zinc		Barrel value	Soda		Soapstone and Talc		Marble		Miscellaneous and unapportioned	
			Pounds	Value	Pounds	Value	Pounds	Value		Tons	Value	Tons	Value	Cubic feet	Value	Kind	Value
1880	\$18,048	140,000															
1881	170,000	140,000															
1882	230,000	140,000															
1883	40,000	140,000															
1884	50,000	140,000															
1885	50,000	140,000															
1886	50,000	140,000															
1887	50,000	140,000															
1888	50,000	140,000															
1889	50,000	140,000															
1890	50,000	140,000															
1891	50,000	140,000															
1892	50,000	140,000															
1893	50,000	140,000															
1894	50,000	140,000															
1895	50,000	140,000															
1896	50,000	140,000															
1897	50,000	140,000															
1898	50,000	140,000															
1899	50,000	140,000															
1900	50,000	140,000															
1901	50,000	140,000															
1902	50,000	140,000															
1903	50,000	140,000															
1904	50,000	140,000															
1905	50,000	140,000															
1906	50,000	140,000															
1907	50,000	140,000															
1908	50,000	140,000															
1909	50,000	140,000															
1910	50,000	140,000															
1911	50,000	140,000															
1912	50,000	140,000															
1913	50,000	140,000															
1914	50,000	140,000															
1915	50,000	140,000															
Totals	\$5,645,375	\$5,515,681		\$1,221,510					\$8,466,870	157,387	\$1,012,750	2,083	\$25,710	78,000	\$219,300		\$1,683,250

*Submitted to general individual
... marble, pumice, salt

Totals

Gold	5,645,375
Silver	5,515,681
Lead	1,221,510
Copper	
Zinc	
Soda	1,012,750
Soapstone and Talc	25,710
Marble	219,300
Other miscell.	1,683,250
Total	22,000,000

operations exclusively to the state of Nevada. Plant No. 2 generates 6000 k.w.; No. 3, 6750 k.w.; and No. 4, 6000 k.w.

The Southern Sierras Power Co., has two hydroelectric plants on Bishop Creek and leases No. 3 of the Nevada-California Power Co. Plant No. 5 generates 1500 k.w., and No 6, 2000 k.w. Their lines extend from the plants on Bishop Creek down the Owens Valley, with branch to Keeler; to Big Pine; to Palmetto, Nevada, with branch to the Loretto Mine; and northward to Lundy, Mono County.



Photo No. 25. Dam for Station No. 3 of the Nevada-California Power Co., on Bishop Creek, Inyo County. Leased by the Southern Sierras Power Co. Courtesy of Mr. P. R. Ferguson.



Photo No. 26. General view of Station No. 5 of the Southern Sierras Power Co., on Bishop Creek, Inyo County. Generates 1500 k.w. Courtesy of Mr. P. R. Ferguson.

GENERAL CHARACTER OF THE ORE DEPOSITS.

The deposition of minerals took place principally during the post-Jurassic and pre-Tertiary period and again during the Tertiary period.

POST-JURASSIC AND PRE-TERTIARY DEPOSITS.

Deposits in, or in Contact with, Granite.

1. *Pegmatite dikes*, carrying small amounts of gold, copper, hübnerite or scheelite, associated with garnet, epidote, magnetite, muscovite or hornblende. These are found at Tungsten, 8 miles west of Bishop; near Goldbelt spring, Ubehebe district; and at the tungsten properties, two miles southwest of the Loretto mine. They often occur along contacts of granite with limestone. Values are usually in tungsten.

2. *Quartz veins*, filling fissures, joints and brecciated zones, carrying predominantly pyrite and chalcopyrite with gold and copper, or galena and sphalerite with silver. Molybdenite is also found occasionally. Impregnations of the minerals sometimes occur in the wall rock. Values are usually in gold, silver and copper; *e. g.*, the Loretto Copper Mine.

Deposits in Limestone and Other Paleozoic, or Mesozoic, Sediments.

1. *Quartz veins*, filling faults, fissures, joints, bedding planes or brecciated zones, usually in the neighborhood of granitic intrusions. Original sulphides, pyrite, chalcopyrite, or galena. Values usually in gold and silver; *e. g.*, Chloride Cliff and Golden Treasure mines.

2. *Irregular masses* and veins, occupying faults, joints, bedding planes and brecciated zones. Original sulphides, galena and sphalerite. Calcite or fluorite commonly associated. Carbonates of lead, zinc and copper, zinc silicate, copper and lead sulphates, lead molybdate, or native silver often present. Oxidized zone deep. Value usually in lead, silver, zinc. Antimony ores occur similarly; *e. g.*, Cerro Gordo and Wildrose mines.

3. *Replacement deposits*, or deposits formed by metasomatism, where acid mineral bearing solutions have migrated upwards, acted upon the limestone and deposited their mineral. This process is no doubt going on continuously and accounts for the enlargement and enrichment of the ore bodies in the upper levels in many of the mines, *e. g.*, silver-lead mines, throughout the eastern part of the county.

4. *Contact veins* between limestone, or other metamorphosed sediments, and porphyry dikes. Mineralization probably accompanied the intrusion of the dikes. Values in gold, silver, copper, lead or zinc; *e. g.*, Keane Wonder Mine.

TERTIARY DEPOSITS.

1. *Quartz veins* in volcanic rock, carrying gold, silver and copper, *e. g.*, Coso Mountains and Greenwater.

2. *Gold and copper* ores along contacts of Tertiary lavas with Paleozoic limestone.

3. *Sedimentary deposits* interbedded with clays and sandstones, secondarily fill fractures in sedimentary deposits, *e. g.*, Colemanite, nitrate and gypsum deposits.

QUATERNARY DEPOSITS.

1. *Soda and salt deposits* formed by Pleistocene and recent evaporations of inclosed lakes.

MINING DISTRICTS, METALS AND SHIPPING POINTS.

Table of mining districts in Inyo County, with location of same with reference to nearest shipping point and the predominating metals in each:

District*	Metals	Location and nearest shipping point
Beveridge	Gold	Summit of Inyo Mts., 10 miles NE. Mt. Whitney Station; S. P. R. R.
Big Pine	Lead, silver, gold...	Western flank of Inyo Mts., E. and SE. of Zurick Station; S. P. R. R.
Bishop Creek	Gold, tungsten	Eastern foothills of Sierras, 10 miles SW. of Laws Station; S. P. R. R.
Cerro Gordo	Lead, silver, zinc, copper, gold.	Western slope of Inyo Mts., 5 miles east of Keeler; S. P. R. R.
Chloride Cliff	Gold, lead, copper, quicksilver.	Summit of Funeral Mts., 18 miles SW. of Rhyolite, Nevada.
Darwin	Lead, silver, copper, gold.	Western slope of Darwin Hills, 24 miles SE. of Keeler.
Daylight	Gold, silver, copper, lead.	Eastern slope Funeral Mts., 15 miles SW. of Rhyolite, Nevada.
Deep Springs	Copper, gold, lead, silver.	Deep Springs Valley, 20 miles E. of Laws; S. P. R. R.
Echo Cañon (Schwab).....	Gold	Funeral Mts., 10 miles NW. of Death Valley Junction; T. and T. R. R.
Emigrant	Gold	Panamint Range, 60 miles N. of Trona; S. P. R. R.
Furnace Creek (Greenwater)	Copper	Amargosa Range, 60 miles N. of Trona; S. P. R. R.
Goldbelt	Copper, gold, tungsten.	Western flank of Panamint Mts., 30 miles E. of Keeler; S. P. R. R.
Grapevine Cañon	Gold, silver	Western slope of Grapevine Mts., 24 miles SW. of Bonnie Claire, Nev.
Harrisburg	Gold	Panamint Range, 55 miles N. of Trona; S. P. R. R.
Independence (Waucoba) ..	Lead, silver, gold...	Inyo Mts., 10 miles NE. of Kearsarge; S. P. R. R.
Kearsarge	Gold, silver	Eastern flank of Sierras, 14 miles W. of Kearsarge Station; S. P. R. R.
Kelley	Gold, silver	Western slope Argus Mts., 20 miles NE. of Brown Station; S. P. R. R.
Lee	Lead, silver, zinc, copper, gold.	Eastern spur of Inyo Mts., 30 miles SE. of Keeler; S. P. R. R.
Lee's Camp	Gold, silver	Eastern slope of Funeral Mts., 6 miles W. of Leeland; T. and T. R. R.
Lone Pine	Gold	Alabama Hills, 4 miles W. of Mt. Whitney Station; S. P. R. R.
Lookout (Modoc)	Lead, silver, zinc...	Eastern slope of Argus Mts., 30 miles N. of Trona; S. P. R. R.
New Coso	Lead, silver, copper, gold.	Eastern slope Coso Mts., 30 miles SSE of Keeler; S. P. R. R.

*U. S. Geol. Surv. Bull. 507, pp. 115-120.

District*	Metals	Location and nearest shipping point
Panamint (Ballarat) -----	Lead, silver, copper	Eastern slope of Panamint Range, 25 miles N. of Trona; S. P. R. R.
Poison Spring -----	Gold -----	Death Valley, 16 miles W. of Leeland; T. and T. R. R.
Russ -----	Lead, silver, gold..	Western flank of Inyo Mts., 15 miles NE. of Mt. Whitney Station; S. P. R. R.
Saratoga (Tecopa Mt.)----	Lead, silver, zinc, copper, gold.	Tecopa Mt., 7 miles E. of Tecopa; T. and T. R. R.
Sherwin -----	Gold -----	Eastern flank of Sierras, 25 miles W. of Laws; S. P. R. R.
Skidoo -----	Gold -----	Panamint Mts., 60 miles N. Trona; S. P. R. R.
Swansea (Keeler) -----	Lead, silver, gold..	East side of Owens Valley at Keeler; S.P.R.R.
Tibbets -----	Gold, silver -----	Inyo Mts., 16 miles N. Kearsarge; S. P. R. R.
Tinnemaha (Fish Spring)..	Gold -----	Fish Spring Hills, 10 miles S. of Zurick; S. P. R. R.
Tucki Mountain -----	Gold -----	Tucki Mt., 65 miles N. of Trona; S. P. R. R.
Ubehebe -----	Lead, silver, copper, gold, tungsten.	Ubehebe Peak and vicinity, 52 miles SW. of Bonnie Claire, Nev.
Union -----	Lead, silver -----	Eastern flank White Range, 12 miles SSE. of Laws, S. P. R. R.
Wildrose -----	Antimony -----	Eastern flank of Panamint Mts., 40 miles N. of Trona.
Willow -----	Gold, silver -----	Amargosa Range, 15 miles NW. of Zabriskie; T. and T. R. R.

*U. S. Geol. Surv. Bull. 507, pp. 115-120.

ANTIMONY.

Wildrose Mine. Wildrose district. Lies on the western flank of the Panamint Mountains, south of Wildrose Cañon and 45 miles by road north of Trona. Elevation 5000 feet. Irregular veins of stibnite, varying in width from a few inches to over a foot, are deposited in schist. The general trend of the stringers is E. and W., and their outcrops can be traced for several thousand feet along the ridge. Large boulders of the stibnite, which on the periphery have been oxidized to a yellowish oxide of antimony, are found near the surface. Mined by open cuts and narrow drift tunnels. It is impossible to estimate the amount of workings, as many of the tunnels are filled with waste or are caved. Mined intermittently since the early nineties. Taken over by present company January, 1915. Present work consists of hand drilling and picking in open cuts, and sorting ore from old dumps. All work done by contract with Mexican labor; 30 men employed. The ore, averaging 35% or over in antimony, is hauled to the railroad at Trona by five 2½-ton Moreland auto trucks. Round trip made in 2 days. The ore is shipped to the company's smelter at San Pedro, Cal. Owned by the Western Metals Co., Security Building, Los Angeles, Cal. M. Elsassner, manager; E. T. Hager, mine superintendent, Trona, Cal.

Bibl.: Rept. XII, p. 21.



Photo No. 27. Burro train, ore chute and ore bin at Wildrose Cañon Antimony Mine.



Photo No. 28. Camp at Wildrose Cañon, showing trucks used for hauling antimony ore to Trona.

Williams and Johnson Prospect. Located on the eastern slope of the Argus Mountains, between Revenue and Shepherd cañons, 18 miles by road north of Trona. The deposits of stibnite are said to outcrop at intervals over a distance of 1500 feet. An analysis of samples taken from croppings averaged 37% antimony. Located April, 1916, by Ralph Williams and George Johnson, of Bishop, Cal. Reported to have been recently sold to some mining men of Los Angeles, who are to begin immediate development.

Large deposits of **antimony** are said to occur in the east flank of the Panamint Mountains, near the summit of the ridge. As these deposits are very inaccessible, they have never been worked and little is known concerning them.

BORAX.

Borax was first discovered in Inyo County in 1874, in the playa deposits of Saline Valley. A "boom" immediately followed, and over a hundred quarter-sections of land were entered as borax land at the United States Land Office at Independence. The crust containing borax was said to be from 6 inches to 2 feet thick. Considerable borax was produced from this deposit up to 1895.⁵ A few years following the discovery in Saline Valley, the marshes in the vicinity of Resting Springs and of Death Valley, north of Furnace Creek, were found to contain borax crusts. Plants were erected for dissolving the impure crust in boiling water and re-crystallizing the borax. The borax was hauled, by the much advertised 20-mule teams, over the desert 165 miles to Mojave.

⁵See Bull. 24, p. 49; Rept. XIII, p. 46.

Since much has been written concerning the working of these old deposits, no further detail will be entered here. The marsh deposits were abandoned about 1890, due to the discovery of bedded deposits at Borate, 12 miles northeast of Daggett, San Bernardino County. These were found to be quite extensive and much purer than the playa deposits.

The value of the Daggett deposits led to extensive prospecting, and development of the colemanite deposits in Inyo County resulted. The production of borax and boric acid is now derived wholly from colemanite. The deposits of Inyo County occur in the foothills of the Black Mountains east of Furnace Creek. They extend in a narrow belt for many miles, and are owned by the Pacific Coast Borax Co. The



Photo No. 29. Old Amargosa Borax Works, south of Zabriskie. Worked in 1876.

southernmost deposit was located 7 miles southwest of Death Valley Junction and known as the Lila C. mine. This mine was a continuous producer from 1907 to December, 1914, at which time it had been completely worked out. (For description of the Lila C. mine, see U. S. Geol. Surv., Mineral Resources of the U. S. 1911, p. 861.) Abandoned January, 1915, and camp moved to undeveloped deposits in the same belt, 12 miles northwest of the Lila C. The concentrator was removed to Death Valley Junction and a narrow-gauge railroad was built from the Junction to the new camp of Ryan.

The **Pacific Coast Borax Company** is at present the only producer of borax in Inyo County and is mining colemanite at four adjacent properties, namely: The Biddy McCarty, Grand View, Lizzie V. Oakley and Played Out mines. The main camp, called Ryan, is at the Biddy McCarty mine, 20 miles north of west of Death Valley Junction. The Death Valley railroad, a narrow-gauge road controlled by the same company, connects Ryan with Death Valley Junction. Gasoline trains

are used for hauling ore from the outlying mines to the storage bins at Ryan.

The borate-bearing beds of this vicinity are part of a series of Tertiary lake beds, which consist of thin-bedded light-colored shales.



Photo No. 30. Old Coleman Borax Works, 2 miles north of Furnace Creek Ranch.

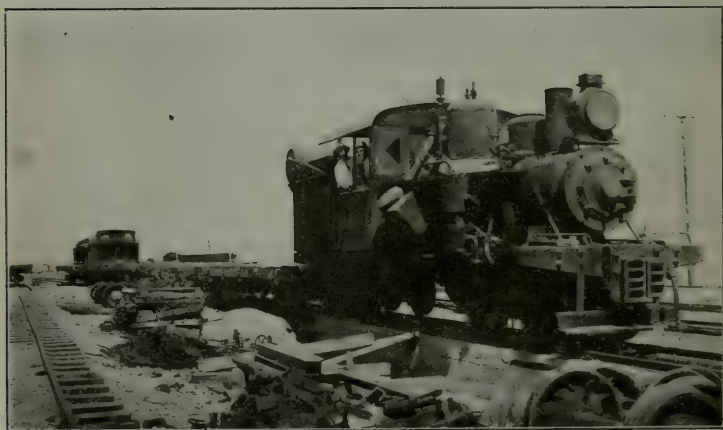


Photo No. 31. First locomotive used to haul borax out of Death Valley, at Death Valley Junction. Photo by H. Knight.

Underlying these shales are thick beds of coarse sandstone and tuff. The sandstone exposures form conspicuous bluffs at the camp of Ryan, below the Upper Biddy workings. The borate-bearing beds are capped with basalt, which forms the crest of the ridge back of the mine. The

colemanite deposits are distinctly bedded and vary in thickness up to 70 feet. The strata have been considerably faulted so that there is no great regularity to the deposits.



Photo No. 32. View eastward, showing borax formation at Biddy McCarty Mine, and lava capping at Ryan.

The purest deposits are usually found nearest the capping. The heaviest beds so far uncovered are found at the Upper Biddy workings. They are from 20' to 70' thick and are worked by quarrying. A tunnel 190 feet long connects the quarry with a gravity tram, by which the



Photo No. 33. Ore bins and town of Ryan, looking northwestward down Furnace Creek.

ore is dumped to the storage bins at the railroad. This is largely first-class ore, being practically pure colemanite. The colemanite occurs massive and more or less crystallized. The crystals occur both in prismatic form, varying from minute size up to a couple of inches in



Photo No. 34. View northwestward, showing method of mining colemanite at Biddy McCarty Quarry. Lower Biddy McCarty Mine in the distance.

length, and in radiating or plumose structure in the beds. Underlying the purer beds, colemanite is found as stringers in the shale, due to leaching and recrystallization of the upper beds. It is also found mingled with shaly matter which ore is necessarily concentrated. The

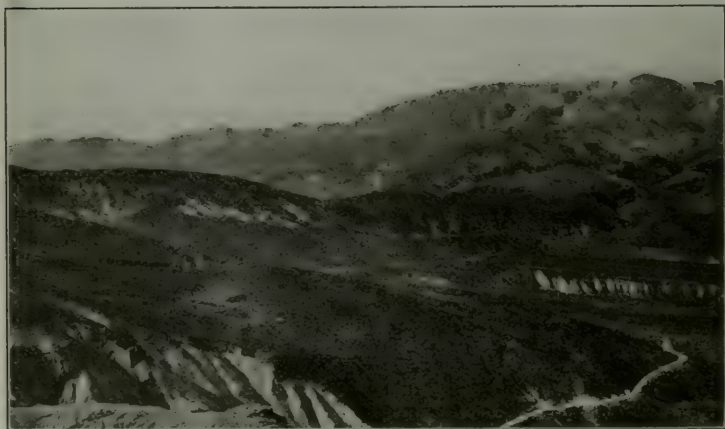


Photo No. 35. Hauling borax with gasoline train from Lizzie V. Oakley Mine to Ryan for shipment. Train is just rounding curve to the right.

second-class, or mill ore, is mined by tunnel and stope. The main working tunnel of the Upper Biddy, through which the second class ore is trammed, is 210 feet long. It is connected by chute to upper drifts and stopes that lie below the quarry.



Photo No. 36. Concentration mill of the Pacific Coast Borax Company at Death Valley Junction, Inyo County, California.



Photo No. 37. Rotary roasters at mill of Pacific Coast Borax Company, Death Valley Junction.

The mining is all done by hand drilling, as the colemanite is very friable. About 150 men are employed at the group, producing 50 tons of first-class ore and from 150 to 200 tons of second-class ore. The first-class ore is shipped directly to the refineries at Alameda, Cal., or Bayonne, N. J. All second-class ore is concentrated at Death Valley Junction.



Photo No. 38. Sacking concentrates at the plant of the Pacific Coast Borax Company, Death Valley Junction.

Concentration process: The ore is fed into a No. 5 gyratory crusher and passed through rolls, spaced so as to crush to $\frac{3}{4}$ " size, or finer. A belt-conveyor elevates the crushed ore to 2 large steel storage tanks from which it is automatically fed to four 6'x50' rotary roasters. The roasters are fitted with inner chambers which carry the ore so that the flame does not come in direct contact with the ore. Crude oil is used for fuel. The roasting temperature is 1300° F. The colemanite decrepitates to a fine white powder and is separated from the shaly particles and impure portions which do not break down by passing over 24-mesh shaking screens. The powder, averaging 42% B_2O_3 , is sacked upon cooling and shipped to the refineries, for the manufacture of boric acid and borax products. The mill makes a 44% recovery. Thirty tons of dust, averaging 45% B_2O_3 , are recovered each week. The dump averages 4% B_2O_3 . A 280-h.p. Diesel engine supplies power

for operating the mill. Thirty men employed. Pacific Coast Borax Co., owner, Syndicate Bldg., Oakland, Cal. R. C. Baker, president; W. F. Wempahl, secretary; John Ryan, general manager; H. W. Faulkner, mine superintendent; F. W. Corkill, mill superintendent.

COPPER.

Although there are deposits of copper in many localities in Inyo County, there has been very little production from ore bodies that contain copper as the predominating metal. The greatest production has been that in association with gold, silver and lead ores containing small percentages of copper. The present high price of copper has done much toward the development of some old properties and the prospecting for new. After the failure of the Greenwater district in 1908, practically all copper mining ceased until the rise in the price of that metal during 1915. At present there is considerable activity in the Ubehebe district.

Districts.

The **Ubehebe District** is located northeast of Keeler, embracing that territory bounded on the west by Saline Valley, on the south by spurs of the Inyo Range extending to Hunters Mountain, on the east by the continuation of the Panamint Range, and on the north by the Last Chance Mountains, comprising an area about 15 miles long and nearly as wide. Ubehebe Mountain is the most conspicuous topographical feature of the district, rising to an elevation of 5570 feet. The mountains are composed of granite, quartzite and lime, with occasional diorite dikes. The ores are found mostly in the limestone, on the contact with the granite, or close to it. The veins are generally well defined and wide, the gangue rock consisting of siliceous iron, quartz and calcite. The ores are principally the oxides and carbonates of copper, with some chrysocolla and occasionally sulphides.

Due to its inaccessibility and lack of water, the district suffers a great disadvantage. The only available water is that at Dodd's Springs and Quartz Springs, 6 miles north and southeast, respectively, of Ubehebe Mountain.

Bibl.: Bull. 50, pp. 301-315.

The **Darwin, or New Coso District**, lies 24 miles southeast of Keeler, along the western slope of the Darwin Hills, which trend in a northwest direction. The length of the range is approximately six miles. This region is composed of limestone overlying granite, intruded by numerous porphyritic and dioritic dikes. As in the Ubehebe district, the veins are found along the contact, or in the lime, close to the contact, but are not known to occur in the granite. The vein matter consists of siliceous iron, quartz and massively crystalline calcite, carrying the

oxides of copper and iron, galena and carbonate of lead, silver and a little gold.

Water is piped by gravity from the Coso Mountains, a distance of 8 miles, to Darwin, and sold for mining purposes. The Darwin Development Co. has a well at the lower end of Darwin Wash that is ample for mining and milling purposes. The ore is hauled by motor trucks and teams to the railroad at Keeler, at a cost of \$6.00 to \$7.00 per ton.

The **Greenwater District** is located on the eastern slope of the Black Mountains south of Furnace Creek and north of 36° N. latitude. It is about 15 miles by road southwest of Death Valley Junction, a station on the Tonopah & Tidewater Railroad. This district came into



Photo No. 39. Darwin, looking northward.

prominence in 1906, when Charles Schwab and associates became interested. Many claims were taken up, and the town of Greenwater was established. The life of the camp, however, was very short, and one deserted cabin is all that remains of the old town.

The ore, consisting of oxides of copper, principally malachite, chrysocolla, azurite, cuprite and melaconite, occurs in dikes of siliceous iron in eruptive rocks, largely andesites and rhyolites. Shafts were sunk to 500 feet on the veins, but no sulphides were encountered. Very little ore was shipped from this district, as most of the work was development. All work ceased when the price of copper fell during the panic of 1908. Practically no work has been done in this district since.

Bibl.: Bull. 50, pp. 317-324.

Mines.

American Mine is situated 12 miles west of Zabriskie, a station on the Tonopah and Tidewater Railroad, on the eastern slope of the Black Mountains and four miles south of Sheephead Springs. The ore occurs in a vein of barytes in a laminated schist along the contact of monzonite and granite. The vein is said to average from 18" to 2' wide, carrying sulphides of copper with some silver and gold. The mine was located in 1902, and from 1906 to 1914 is said to have produced \$10,000. Ore shipped averaged 4% copper, 15 ozs. silver, and \$4.00 in gold per ton. Development consists of a 50-foot incline shaft on the vein, 175-foot tunnel, and 80 feet of drifts. This property has recently been purchased by J. J. Rodgers, of Zabriskie, and C. B. Zabriskie, of the Pacific Coast Borax Co., who are now developing it.

Anton and Pabst or Inyo Mine. Lee district, 16 miles in air line east of Keeler. This property recently leased to "Tex" Hall, of Keeler, who has twelve men working. Ore hauled about 30 miles to the railroad at Keeler. John C. Anton, Jr., and David Pabst, Lone Pine, Cal., owners.

Bibl.: Bull. 50, p. 306.

Blue Jay Mine, Ubehebe District. Located on the east side of Saline Valley. Tunnel 100 feet, winze 35 feet deep, crosseut 25 feet. Ore: malachite and chalcocite. Outcrop 60 feet wide and 500 feet long.

Bibl.: Bull. 50, p. 310.

Butte Group, consisting of 6 claims in the Ubehebe district. Located midway between the Racetrack and Dodd's Spring. Wagon road to property from Bonnie Claire, Nevada, 65 miles. One hundred tons of ore, averaging 24% copper and \$10.00 in silver and gold per ton, were shipped in 1912. Development consists of three tunnels on the vein, totaling 300 feet in length. The greatest vertical depth below the outcrop is 150 feet. Assessment work only. Owners, R. C. Spear, E. L. Spear and B. R. Hunter, Lone Pine, Cal.

Copper King Group. A group of claims in the Ubehebe district are reported to belong to Jack Salsbury, San Francisco, Cal.

Copper King Mine, Ubehebe district, 2 miles south of the Race-track. Sixty miles by tractor road to Bonnie Claire, Nevada. Elevation 4000 feet. Water must be hauled over trail from Dodd's Spring, 4½ miles south. The ore, consisting of oxides and occasional sulphides of copper, occurs in a vein along the contact of lime and granite.

Strike is E. and W.; dip, S. Outcrops for 1500 feet along the contact. Development consists of two 40-foot tunnels and 50 feet of drifts. No production. Idle. Owners, R. McMahon, C. W. Bretz, G. K. Collins, Bishop, Inyo County, Cal.

Copper King and Star Mines, Ubehebe district. Idle. See Bull. 50, pp. 309-310.

Coso Copper Company (Ridgeway Mine) in New Coso district, 1 mile southeast of Darwin and 25 miles, by road, southeast of Keeler. Elevation 4850 feet. Fissure vein in the limestone, averaging 4 feet in width. The vein matter, consisting of siliceous iron, quartz and calcite, carries oxides of copper and iron, silver and gold. Strike N. 45° W., dip 65° SW. Opened by a 120-foot shaft on the vein, with short drifts at 20-foot and 45-foot levels. Stoping on both drifts. A 4 h.p. gas engine hoist used for hauling ore. Fifty tons of ore shipped from this property during April, 1916, by the lessees, Chas. Grimes and Harry Long, of Pasadena. Nine men employed. John H. Thorndike, manager.



Photo No. 40. Coso Copper Company Mine, Darwin.

Coso Copper Claims, Coso district, 30 miles, by road, SE. of Keeler. Contact vein 6' wide on limestone hanging and granite footwall, carrying oxides of copper and iron. Four men employed sinking shaft on vein. Owners, Dr. I. J. Woodin, Walter Moore and Adolph Rominger, Independence, Cal.

Green Monster Mine. Seven miles east of Independence on west flank of Inyo Range. Idle. Recently bonded to Thomas F. Butler, San Francisco. Owned by Martin Luther, San Jose.

Bibl.: Bull. 50, p. 306; U. S. G. S. Bull. 540, p. 120.

Greenwater Mine, Greenwater district, 15 miles southwest of Death Valley Junction. Ed Bahten, of Silver Lake, holds lease on property and is working in open cut above old shaft. Vein exposed 10 feet wide, carrying malachite, azurite and chrysocolla. One carload shipped early in March, 1916. Owned by Greenwater Death Valley Copper Company.

Bibl.: Bull. 50, pp. 317-322.

Inyo Copper Mines and Smelter Co. has 19 claims in lime and quartzite in the Ubehebe district. Ore on 12 claims is reported to vary from 4% to 41% copper with some gold and silver. Idle. R. G. Paddock, manager, 2257 Union street, San Francisco.

Jumbo Mine, Cerro Gordo district, 7 miles southeast of Keeler on west slope of Inyo Range. Elevation 5790 feet. The ore occurs in irregular lenses in limestone, with well-defined hanging but indistinct footwall. The strike of the hanging wall is N. 25° W., dip 68° W. Development consists of two tunnels and an open cut. Lower tunnel 240 feet, upper tunnel 150 feet; 40-foot winze in upper tunnel. Work at present confined to stoping ore bodies in the two tunnels. Seven men employed. Ore is packed by burros 1 mile to camp and hauled 7 miles to Keeler. Shipping approximately 4 tons daily. Said to average 8% Cu, 15% Pb, 4 ozs. Ag. Owned by the Darwin Development Company, No. 71 Broadway, New York. F. N. Weeks, consulting engineer.

Loretto Mine. Located on the western slope of Eureka Valley, 28 miles due east of Big Pine. Elevation 5200 feet at camp. A fairly good wagon road from Big Pine to the camp. Water is hauled 15 miles from Willow Spring. The ore body is in granite. The present company took over the property in 1907 and sunk an 1800-foot shaft on vein, with the hope of reaching the sulphide zone. A large body of low grade oxidized copper ore was disclosed, but it was found that the vein apparently did not continue with depth. Operations on the property were therefore discontinued in September, 1915. It is possible that they may be renewed later if a satisfactory method is found for treating the low grade oxidized ores. No production. Owned by the Loretto Mining Company; president, Thos. A. McDonald, No. 111 Broadway, New York; general manager, J. G. Kirchen, Tonopah, Nevada.

Mountain Copper Group. A group of claims in the Ubehebe district are reported to belong to Mr. Jack Salisbury, San Francisco, Cal.

Navajo Chief Mine. Ubehebe district. Idle. See Bull. 50, pp. 303-304.

Oasis Copper Mine, Deep Springs district. Thirty miles northeast of Big Pine and about 2 miles south of Oasis. The ore, oxides of copper principally, occurs in veins in limestone about 50 feet from the granite contact. There are three veins exposed on surface for 50', 1000'

and 3000', respectively, each averaging 4' to 5' in width. Developments consist of open cuts and a 50-foot shaft. A 25-h.p. gas engine hoist is used at the shaft. Water is hauled 2 miles from Deep Springs Ranch. Six men employed to carry on development work since December, 1915. Owned and operated by the Oasis Copper Corporation, 25 Broad St., New York; F. N. Weeks, consulting engineer.

San Rafael Prospect, Wildrose district. Located on the west slope of the Panamint Range, one mile north of Tuber Creek and forty miles by road north of Trona, the nearest point on railroad. Quartz ledge, said to be 12 feet wide on contact of schist and porphyry. Samples recently taken from outcrop are said to have assayed 21% lead, 7% copper, 4 ozs. silver and \$0.85 in gold. Recent location, no development. Owned by Y. Ruiz and L. C. Julian, Lone Pine, Cal.

Settle Up Prospect, Ubehebe district. Five miles south of Dodd's Springs and 60 miles by road southwest of Bonnie Clare, Nev. Elevation 4000 feet. Water is hauled from Dodd's Springs 5 miles southeast of the mine. The oxidized ores of copper with some chalcopyrite occurs along a contact between lime and granite. The vein material is mostly calcite and is said to outcrop for several thousand feet. Some 18 short prospect tunnels have been driven at various intervals along the outcrop, but no ore has been shipped. Two men employed. Located January, 1916, by W. S. Ball, J. T. Bradbury and Harry Klein, Venice, Cal.

DOLOMITE.

Badgley Quarry, Swansea (Keeler) district. Four miles north of Keeler, at the western base of the Inyo Mountains. Eighty acres patented, formerly owned by the original Inyo Marble Company (see Inyo Marble Co.). The marble beds here are folded and shattered. Quarried for use as dolomite. Hand drilling; one man employed. Spur track of the California and Nevada railroad to quarry. Approximately forty tons of dolomite per week are shipped to the California Iron and Steel Company at Los Angeles, Cal. Owned by W. O. Badgley, Monadnock Bldg., San Francisco, Cal.

Natural Soda Products Company, of Keeler, are shipping about 20 tons daily of the pure white dolomite from the quarries of the Inyo Marble Company to their soda plant south of Keeler. Seven men employed at \$3.00 per day. The dolomite is used for generating carbon dioxide. An analysis of this material determined at the State Mining Bureau (Report X, p. 218) follows:

Carbonate of lime.....	54.25 per cent
Carbonate of magnesia.....	44.45 per cent
Iron and silica.....	.60 per cent

99.30

GOLD.

Actual gold mining in Inyo County started with the establishment of the Russ mining district, in the Inyo Mountains east of Independence, in 1861. At about the same period the Kearsarge district was established on the eastern flank of the Sierras below Kearsarge Peak at an altitude of from 8000 to 10,000 feet. The ores of the latter district were predominantly silver, having a low gold content.

Placers were worked for several years in Mazourka Cañon. This cañon is on the western slope of the Inyo Mountains, east of Independence. Dry washers were used. The ground was practically exhausted, and placer mining in Inyo County ceased.⁶

The gold deposits of the Inyo and White Mountains have, thus far, been the principal producers, although they are now mostly idle. The gold ores, which are oxidized and vary in value from low to high grade, are found in narrow quartz veins. The veins occur along the borders of granitic intrusions or in the surrounding country rock.⁷ The Beveridge district, situated along the summit of the Inyo Mountains east of Lone Pine, was the most important gold producing district. It can be reached only by trail, and until adequate roads are constructed, there is little hope for any further development of that district.

In recent years gold mining in Inyo County has been principally confined to the few scattered mines of the Funeral, Panamint and Argus mountains.

Black Eagle Mine (Quartz). Union district. Situated on the west flank of the Inyo Mountains, four miles east of Kearsarge station. Elevation 8300 feet. Idle. Owned by George Lewis, Independence, Cal.

Bibl.: U. S. G. S. Bull. 540, p. 116.

Burgess Mine (Ironside Mine) (Quartz). Beveridge district, 10 miles northeast of Mount Whitney station. Trail to mine from Mount Whitney station. Elevation 9200 feet. Idle. Owned by Mrs. Kate Wells, Lone Pine, Cal.

Bibl.: U. S. G. S. Bull. 540, p. 119.

Cashier Mine (Lode). Wildrose district. Fifty-five miles north of Trona and 9 miles south of Skidoo, at the old town of Harrisburg. Elevation 5000 feet. Located in 1905 and worked continuously from 1906 to 1909. Taken over by the present owners in 1910. The ore, free milling gold, occurs in an irregular lens-shaped body, varying from 6" to 12' in width, in limestone. A 400' incline shaft has been sunk on the ore body and levels driven at 100', 200', 300' and 400'. Considerable drifting has been done on the 1st, 2d and 3d levels. The 100-foot is the main working level and connects with the surface at 350 feet from the

⁶See Rep. XIII, p. 182.

⁷Adolph Knopf—Mineral Resources of the Inyo and White Mountains, U. S. G. S. Bull. 540, p. 112.

shaft. The mine is said to have produced 15,000 tons of ore, which average \$20.00 per ton, practically all of which was taken from the first level and above. No ore has been found below 140 feet in the shaft, where the ore body appears to pinch out entirely.



Photo No. 41. Cashier Mine, Harrisburg.

The ore is treated in a 5-stamp Joshua Hendy mill. The pulp is run over amalgamation plates and the tailings cyanided. Capacity of mill 20 tons per 24 hours. Water is piped to the mill 2 miles from the Skidoo pipe line. A distillate engine furnishes power to the plant. Property under lease to P. R. Turner and Robert Weir, who are stoping on the 100-foot level. They intend to run about 50 tons of ore through the mill before the expiration of their lease in October, 1916. Owned by the Cashier Mining Company, 809 Hollingsworth Bldg., Los Angeles, Cal.

Cecil R. Mine (Quartz). South Park district. Five miles south of Ballarat, on the west slope of the Panamint Mountains. Elevation 1250 feet. Well defined quartz vein in schist. Strike N. 6° W., dip 21° W. Varies from 18" to 5' in width. Free milling. Development consists of three tunnels on the vein, 126', 177' and 147', respectively. No equipment. Idle. Owners, the Cecil R. Mining Company, 1008 Baker-Detwiler Bldg., Los Angeles, Cal.

Chloride Cliff Mine (Quartz). In Chloride Cliff district, 18 miles west of Rhyolite, along summit of Funeral Mountains. Elevation 5300 feet. Good auto road from Rhyolite or Beatty to the mine. Quartz veins containing galena, pyrites and some free gold, are deposited in

limestone along contact of quartzite. Said to average \$23.00 per ton. The formations have been considerably folded and faulted. There are 5 well defined veins, each averaging from 3' to 3½' in width. Their trend is NE.-SW. Development consists of 7 tunnels, the longest of which is 400 feet and the shortest 100 feet. The greatest length driven on the vein is 320 feet. Greatest vertical depth below outcrop, 800 feet. No production. Development work only. Purchased in 1908 by the present owners. Mill erected April 1916, consisting of 7-foot Lane mill, Deister concentrators and small cyanide plant. Operated only a few days, due to shortage of water; 60-foot well sunk one mile from mill pumped dry. Idle. Owned by J. Irving Crowell, Donald Finley and Chas. Parsons, Rhyolite, Nev.

Bibl.: U. S. G. S. Bull. 285, pp. 72, 73.



Photo No. 42. View, looking northeastward, of mill and tanks at Chloride Cliff Mine, Funeral Range, Inyo County.

Coso Milling Company are erecting a custom mill at the Marigold Mine, 7 miles south of Darwin. The mill consists of two 1000-lb. triple discharge stamps, 1 concentrator, 15 h.p. Fairbanks-Morse gas engine for power. Pumping plant installed in creek 1500 feet below mill. Expect to start milling in June, 1916. Will charge flat rate of \$10.00 per ton. Manager, J. O. Lee, Darwin, Cal.

Eureka Mine (Quartz). Situated in the Inyo Mountains, 9 miles northeast of Independence. Elevation 4000 feet. Idle.

Bibl.: U. S. G. S. Bull. 540, pp. 115, 116.

Gold Spur Mine (Quartz). South Park district, approximately 15 miles south of Ballarat. The ore occurs in gneiss. A 300-foot chute

averages 4 feet in width. Outcrops on surface 1000 feet. Said to average \$9.00 per ton. Owned by F. W. Gray and Mr. Thurman of Ballarat.

Golden Eagle Group (Quartz). Located in the Beveridge district. Development consists of a 200-foot and a 60-foot winze; 100 tons of ore hand-sorted and treated at the Keynote mill are said to have averaged \$100.00 per ton. Idle. Owned by John C. Anton, Lone Pine, Cal.

Golden Treasure or Ashford Mine (Quartz). Situated in the western slope of the Funeral Mountains, 30 miles, by road, due west of Zabriskie. Elevation 2000 feet. Wagon road to mine. Free milling gold is deposited in fissure veins in gneiss. There are four veins on property, the main one, the Golden Treasure, varies from 30" to 4' in width, and carries some chalcopyrite. Occasional specks of free gold can be seen in the quartz. Said to assay up to \$325.00 per ton and to average \$40.00 per ton. A 180-foot tunnel has been driven on main vein and 50-foot winze in tunnel. Greatest vertical depth below outcrop 2000 feet. Over 2000 feet of tunnels and drifts on the four veins. Mine

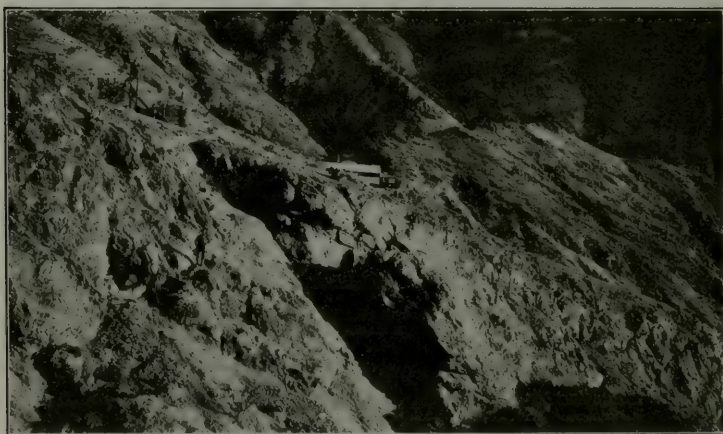


Photo No. 43. Golden Treasure Mine and camp. East side of Death Valley, 30 miles west of Zabriskie.

located in 1906. Development work only until 1914. In November, 1914 it was taken under bond and lease by B. W. McCausland, who erected a mill 5 miles below mine, in Death Valley. The mill included: a jaw crusher, 10-foot Lane mill, 1 Wilfley table, 1 Deister slime table. Well sunk in Death Valley to furnish water for mill. Ore hauled by motor truck from mine to mill. Ceased operations, September, 1915, and property reverted to original owners, due to failure to make first payment

under terms of lease. No records available as to production during this period. Owners, Henry J., Lewis R., and Harold Ashford, Zabriskie, Cal.

Harrisburg Mine (Quartz). Located in the Wildrose district, 55 miles north of Trona, and adjoins the Cashier mine. Quartz vein on contact of lime and granite. Strike N. and S., dip E. Development consists of a 40-foot crosscut tunnel and several shallow pits. Ten tons of ore treated at Cashier mill yielded \$50.00 per ton. Owned by J. P. Augerebery, Harrisburg, Cal.

Holy Roller Prospect, South Park district. Ore said to average \$4.90 per ton. Twenty-foot flat deposit in limestone, near schist; 5000 tons in sight. Water available. Idle. Owned by A. C. Porter of Ballarat.



Photo No. 44. McCausland Mill, in Death Valley, 5 miles below the Golden Treasure Mine, in the Amargosa Mountains.

Keane Wonder Mine (Quartz). South Bullfrog district, is in Sec. 6, T. 29 N., R. 1 E., 22 miles by auto road west of Rhyolite, on the west slope of Funeral Mountains, at an elevation of 3400 feet. Two lenticular ore bodies in schist lie almost parallel, about 100 feet apart. The quartz lenses vary up to 30 feet in width and have been stoped to the surface. They lie almost flat. The ore carries very little pyrite, and averages \$8.00 per ton. Worked through two main tunnels. Impossible to estimate extent of work as the stopes are caved. Mined with air drills. Ore hauled to mill by gravity aerial tramway, which operates a jaw crusher at mine bin. Ore is crushed to 2" size before being sent to mill.



Photo No. 45. Keane Wonder Mine, and head of tramway.

The mill is located at edge of Death Valley at an elevation of 1100 feet. It consists of 20 stamps and amalgamation plates. Crude oil is used for fuel for steam power plant to operate the mill. The tailings are treated at the cyanide plant below mill. The leaching cyanide process consists of a six-day treatment beginning with 3% KCN sol. Zinc boxes used for precipitation. Bullion runs 400 to 500 fine in gold and silver. Ratio of gold to silver $1\frac{1}{2}$: 1. Mine said to have produced



Photo No. 46. Keane Wonder Mill. View northeastward.

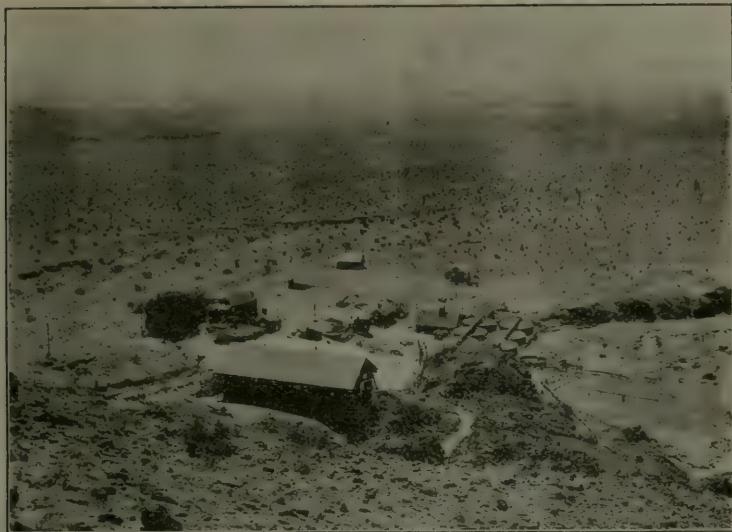


Photo No. 47. Keane Wonder Cyanide Plant. View southwestward.

\$1,100,000. Closed down, May, 1916, as the developed ore bodies were worked out. Company to be organized before doing any further development. Owned by the Francis Mohawk Mining and Leasing Co., B. H. Tatem Estate, and State Bank and Trust Co., of Carson, Nevada. Agent and manager, F. N. Fletcher of Reno, Nevada.

Keynote Mine (Quartz). Beveridge district, 10 miles NE. of Owenyo, a station on the California and Nevada Railroad, on the east slope of the Inyo Mountains. Elevation 7500 feet. The vein follows a granite and porphyry contact. Strike N.-S., dip 42° W. Development consists of 7 tunnels, varying from 150' to 750'. Tunnels connected by winzes and raises. Greatest vertical depth below outcrop 1800 feet. Ore free milling. Formerly treated in arrastra and later in 5-stamp mill. Water piped from Hahns Creek, 3 miles south. Worked continuously from 1878 to 1886, then periodically up to 1907. Assessment work, only, since. There is said to be over 20,000 tons of ore, that will yield \$8.00 per ton, on dumps. Owned by O. S. Williams, 318 West Ave. 53, Los Angeles, Cal.

Bibl. : REP. OF THE DIRECTOR OF THE MINT upon Production of Precious Metals in U. S., 1883, p. 159; U. S. G. S. Bull. 540, p. 112; Register of Mines, Inyo County, 1902.

Lost Burro Mine (Quartz). Ubehebe district, 55 miles SW. of Bonnie Claire, Nevada, in Panamint Range. Elevation 5350 feet. Fissure veins in granodiorite, striking N.-S., slight dip to east. Veins

vary from 4' at outcrop to 6"; appear to pinch out with depth. Several short tunnels driven along vein. Ore said to average \$25.00 per ton. No production. Excavation made for 5-stamp mill and cyanide plant, that were never erected. Water to be piped 8 miles from spring on Tin Mountains. Idle. Owned by Lost Burro Mining Company, Los Angeles, Cal., W. H. Blackmer, president. Reported sold to the Montana-Tonopah Mines Company, Chas. E. Knox, Berkeley, California, superintendent and manager. According to reports in January, 1917, a mill is under construction.

Marigold Mine (Quartz). Coso district, 7 miles south of Darwin and 30 miles southeast of Keeler, on east slope of the Coso Mountains. Elevation 6000 feet. The vein is in granite. Width 6" to 4'; 7 tunnels totaling 2000 feet driven on vein. No stoping. Said to be 200 tons of ore on dumps that will average from \$30.00 to \$40.00 per ton. Ore to be treated at custom mill, now being built by the Coso Milling Company. Are to begin stoping in mine upon completion of mill. Owned by J. O. and L. W. Lee, Darwin, Cal.

Merry Christmas Mine (Quartz). Modoc district. Situated in Snow Cañon, 28 miles north of Trona on the east slope of the Argus Range at an elevation of 3700 feet. The deposit consists of 4 quartz veins following a contact between andesite and granite. The main vein is 4' wide. Ore is base, carrying about $1\frac{1}{2}\%$ lead and some copper. Said to average \$11.00 per ton. A 700-foot tunnel driven on main vein. Greatest vertical depth below outcrop, 325 feet. The mill equipment consists of five 1000-lb. stamps, 1 Wilfley table, 25 h.p. Western gas engine. H. E. Robertson has bond and lease on property, employing 5 men. Owned by Snow Cañon Mining and Milling Co., Dallas, Tex.

Mountain View Mine (Quartz). Beveridge district. It adjoins the Keynote Mine on the west slope of the Inyo Mountains. The ore body consists of a well defined quartz vein 3 feet in width, carrying rusty gold and chalcopryrite. Assays of some hand samples showed 4 ozs. gold per ton and 18% to 30% copper. Tunnel driven on vein 165 feet. No production. Company now being organized to develop property, to be known as North American Metal Mines Company. S. R. Brough, I. W. Hellman Bldg., Los Angeles, trustee.

O. B. J. Mine (Quartz). South Park district. Situated in Tuber Cañon, 15 miles north of Ballarat. The ore is free milling quartz, said to average \$7.00 per ton. Main tunnel 1000 feet. Six stamp mill and amalgamation tables. Water piped $2\frac{1}{2}$ miles from spring. Ten men employed. Owners: Clair Tyler, J. P. Flint and J. C. Kennedy, Los Angeles, Cal.

The **Pine Mountain Group** of seven gold claims is reported to have been leased by Chas. W. Alvord. A quartz ledge in granite is said to

average 4' in width and to assay \$20.00 per ton. The property is located about 2 miles north of Payson Cañon on the toll road to Deep Springs Valley.

Radcliff Mine (Quartz). South Park district, east of Ballarat. Quartz vein. Strike NW. and SE., dip 60° W. Inclined shaft 500 feet. Sulphides in lower workings. A 20-stamp mill and steam power plant; 12,000 tons of tailings stored for future treatment. Idle since 1903. Owners: Craig Grocery Co., Los Angeles. Tax title owned by W. D. Clarke, Los Angeles.

Bibl.: Reg. of Mines, Inyo, Co., 1902.

Reward* and Brown Monster, or Eclipse, Mine (Quartz). Russ (or Independence) district, 2 miles east of Manzanar station. Idle.

Bibl.: Rep. VIII, p. 263; Rep. XII, p. 136; Rep. XIII, p. 180;

Reg. of Mines Inyo Co. 1902; REP. OF THE DIRECTOR OF U. S.

MINT, 1883, 1884, p. 160; U. S. G. S. Bull. 540, pp. 116-118.

Skidoo Mine (Quartz). Wildrose district, 65 miles by auto road north of Trona. Elevation 6500 ft. Two systems of quartz veins occur



Photo No. 48. Camp at Skidoo, on west side of Tucki Mountain, Inyo County.

in a pegmatite granite. The main vein system strikes N.W.-S.E. and dips from 30° to 40° S.W. The other system, E.-W., dips 60° N. Veins average from 18" to 2' in width, with a maximum of 4'. The ore is free milling and values average about \$15.00 per ton. Outcrops of eight veins are now being mined making a total of 2000 feet. There is a 300-foot incline shaft on the E.-W. system and a 300-foot vertical shaft on the main system. Greatest depth on vein, 240' with over one mile of tunnels and drifts. Ore is hauled to the mill through tunnels.

*Reported to have been recently opened up and running a mill and oil flotation plant.

The mill equipment consists of: ten 850-lb. stamps, five 1150-lb. stamps, and amalgamation tables. Table tailings run to cyanide plant, leached 9 days and precipitated in zinc-boxes. Mill operated by water power, conveyed in 8" pipe line 21 miles from Telescope Peak. Pipe line installed at a cost of over \$200,000; 35 men employed at the mine, 6 at mill. Property located in 1906; mill erected 1907. Mill burned down and reconstructed in 1913. Total production to date over \$1,500,000. Owner, Skidoo Mines Co., Skidoo, Cal. C. W. Cross, president; L. W. Orynski, superintendent.



Photo No. 49. Mill and Cyanide Plant at Skidoo Mine, Skidoo, Inyo County.

Union Mine (Quartz). Russ district, Sec. 14, T. 14 S., R. 36 E., M.D.M., 3 miles NW. of Owenyo, near base of Inyo Mountains. Elevation 5500 feet. Wagon road to property. Well defined quartz vein, averaging 5 ft. in width, in metamorphosed lime. Outcrop can be traced several thousand feet. Strike E.-W., dip N. 65°. Low grade ore carrying some galena and silver. Average value, gold \$3.00, lead 3%, silver 5 ozs. Development consists of 5 tunnels, driven on vein, totaling approximately 2000 feet. Greatest vertical depth below outcrop, 1900 feet. There is said to be sufficient water in the lower three tunnels for all mining and milling purposes. A 6" pipe line from creek, 4500 feet, to mine. Mill on property: 7"x9" Blake crusher, 12"x20" Allis rolls, 15 h.p. distillate engine. Development work only. No production. Idle. Owners, W. L. Skinner, C. B. Skinner, R. Volmer, Lone Pine, Cal.

Bibl.: Reg. of Mines, Inyo County, 1902.

Wilshire-Bishop Creek Mine (Quartz). Bishop Creek district, 22 miles SW. of Laws. Good wagon road to mine. Eastern flank of Sierras. Elevation 8500 feet. Inaccessible during winter and spring due to heavy snowfall. Since the property was idle and the mine flooded, it was not visited. Mine is said to have produced 5000 tons of ore, which averaged \$11.00 per ton. Equipment consists of a 10-stamp mill and an all-sliming cyanide plant. Capacity 50 tons per 24 hours. Treatment as follows: Ore crushed in weak KCN solution by ten 1250-lb. stamps, concentrated on double-deck Deister table. Concentrates shipped to smelter. Table tails passed to 5'x16' tube mill and crushed to 150 mesh or finer. Tube mill discharge thickened in 24' Dorr thickener and passed to four agitation tanks. Pulp elevated to Portland filter and pregnant solution precipitated in zinc boxes. Electric power used, supplied by the Southern Sierras Power Co. Mine shut down October, 1915, as company was unable to operate at a profit. A new company, to be known as the Consolidated Wilshire Mining Co., is being organized to take over the stock of the old company on an assessment of 6 cents a share; this to be used to double capacity of present plant. The promoters think that by doubling the mill capacity, the cost per ton will be sufficiently reduced to show a profit. Owner, Rocky Point Consolidated Mines Co.; president, Gaylord Wilshire, Hollingsworth Bldg., Los Angeles.

Wonder Mine (Quartz). Saratoga district, north of Ibex mine. Quartz vein said to carry gold and copper. Two 75-foot shafts on vein. Old mill at property. Idle. Recently purchased by S. F. Brock, manager of the Ibex mine. Equipment to be installed at Ibex mine.

Yucca Mine (Quartz). Coso district, 8 miles by road south of Darwin. Elevation 6000 feet. Highly oxidized quartz veins in granite. Vein matter and granite soft and decomposed. Width 2" to 18". Strike N. and S., dip 30° E. Outcrops 300 feet. Two incline shafts on vein 200 feet deep, connected by levels at 120 feet and 165 feet. Numerous shallow shafts 8' to 20' deep, from which good ore has been shipped. Mined by auger drills and picks. During 1915 shipped over 20 tons averaging \$136.00 per ton. Will haul second-class ore 2½ miles to mill of Coso Milling Co., upon completion of mill. Worked continually since 1908 by the owner, L. D. Owen, Darwin, Cal.

GYPSUM.

Acme Cement and Plaster Co. Large deposit of gypsum on China, or Morrison Ranch, 1 mile northeast of Acme station on the Tonopah and Tidewater Railroad. Spur track to mine. Worked by open cut and tunnels. Shipping 1000 tons per month to plaster plant at Los Angeles. Company manufactures hard (wall) plaster only. Treatment

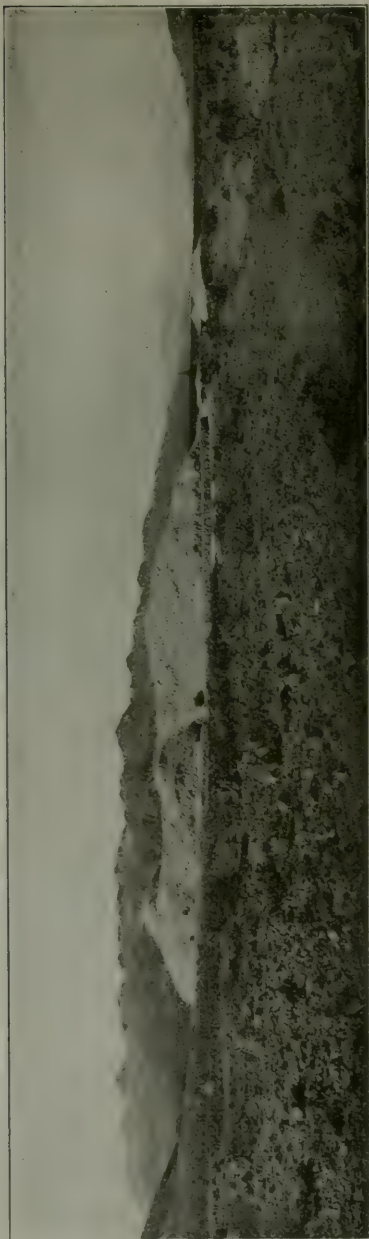


Photo No. 50. Gypsum deposit of the Pacific Coast Borax Company near Ryan, Inyo County.
Courtesy of Mr. John Ryan of the Pacific Coast Borax Company.

consists of grinding to 100 mesh and calcining. Crude oil used for fuel. Sixteen men employed. Home office No. 750 S. Alameda St., Los Angeles, Cal. F. A. Brown, superintendent.

Pacific Coast Borax Co., owns an extensive deposit of gypsum in the foothills of the Black Mountains, 1 mile from the Death Valley railroad. Undeveloped. Company anxious to lease deposit for freight charges. Mr. John Ryan, Syndicate Bldg., Oakland, general manager.

IRON.

J. C. Roper and **John Amick**, of Independence, own a deposit of iron in Inyo Mountains, 7 miles east of Kearsarge Station. Ore is specular hematite, said to carry \$4.96 in gold. Tunnel and shaft on property. No production. Idle.

Coso Copper Claims. Large deposits of iron ore, formerly used for flux at the Darwin smelters, occur on the claims of Dr. I. J. Woodin, Walter Moore and Adolph Rominger. Idle.

LEAD, SILVER, ZINC.

These three metals are grouped under one heading as they occur closely associated in many of the mines.

The earliest mining in Inyo County was that of the lead-silver ores in the southern part of the county, by Mormon colonists, previous to 1859. In 1860 Dr. French started in search of the celebrated "Gunsite" lode. He entered the Coso and Darwin cañons, making many locations, and penetrated as far as Furnace Creek, where were found the old furnaces used to reduce the lead-silver ores.⁸ The famous Cerro Gordo district was discovered between 1862 and 1866. Zinc ores were first mined in 1907, with the discovery of large bodies of smithsonite in the old lead stopes at Cerro Gordo.

The remarkable increase in the value of the metals during 1915 has caused a general revival of the mining industry, with the result of reopening old mines and developing many new properties. The Cerro Gordo district is said to have yielded a total to date of over \$15,000,000, and the Darwin district approximately \$3,000,000.

Districts.

The **Cerro Gordo District** is in the southern part of the Inyo Range, embracing Cerro Gordo Peak, $5\frac{1}{2}$ miles in an airline east of Keeler. It is reached by wagon road from Keeler. The ore bodies form irregular lenticular masses inclosed in limestone. The ores are principally argenterous galena, cerussite, and zinc carbonate, or smithsonite. The deposits were first worked by the Mexicans on a small scale in 1866 and the ores smelted in vassos. In 1869 they were taken over by American

⁸Report of the Director of the Mint upon the Production of Precious Metals in the U. S. during the year 1883, p. 153.

interests and a period of great activity followed. Two smelters were erected at Cerro Gordo, and a third one near the shores of Owens Lake. Scarcity of water and fuel, combined with high transportation costs, made mining and smelting costs prohibitive. The mines were shut down in 1877, as the large, rich bodies of argentiferous galena had been worked out. The completion of the railroad to Keeler in the early eighties revived interest, and the mines were worked periodically for many years. The two most famous mines of the district, the Santa Maria and Union, were consolidated in 1876, and are now known as the Cerro Gordo mine. Having been described in other publications, no further details will be repeated here concerning this district.

Bibl.: MIN. RES. WEST OF THE ROCKY MTS., R. W. Raymond, 1870, pp. 17-19; 1873, pp. 18-22; 1876, pp. 30-32. REPORT OF DIRECTOR OF MINT upon the Production of Precious Metals for year 1883, pp. 161-163; 1884, pp. 102, 103. REP. OF THE STATE MINERALOGIST, 1890, pp. 213, 214. U. S. G. S. Bull. 540, Adolph Knopf, pp. 95-110.

The **Darwin District**, briefly described under the heading "Copper," is essentially a lead-silver district. The ore deposits, principally bodies of argentiferous galena and its oxidation products, range from contact metamorphic deposits to fissure veins in limestone. The gangue is calcite and fluorite, often coarsely crystallized. The district was most active from 1875 to 1877, during which period three smelters were erected. Slag dumps mark their locations. At that time all freight had to be hauled by team across the desert, 275 miles, from Los Angeles. The richer and more easily mined ore bodies were soon exhausted, and the expense being very high, mining subsided and the district lay dormant for many years. The recent activity of the Darwin Development Company in reopening a group of the old mines has revived interest in the district. Should their "oil concentration" mill now being erected prove thoroughly successful, it will undoubtedly increase the general development of the whole district. Considerable low grade ore is exposed in the workings of many of the old properties. A full description of this district is given by Adolph Knopf, "The Darwin Silver-Lead Mining District," U. S. Geol. Surv. Bull. 580-A.

Mines.

Baxter Mine (Lead-silver). Resting Springs district. Four miles east of Evelyn, a station on the Tonopah and Tidewater Railroad, and on the western slope of Resting Springs Mountain. The deposit is a lenticular ore body inclosed in limestone. Development consists of two shallow shafts and a short tunnel. One man working. Ore hauled in 4-ton wagon to railroad. Total production about 200 tons. Owner, J. P. Madison, Shoshone.

Blue Dick Mine (Lead-silver, Zinc). Located in the Kingston Mountains, near the San Bernardino County line, southeast of Tecopa. Ore is said to be deposited in a fissure vein in limestone. Several car-loads shipped during 1914. Analysis of ore shipped: Lead, 32% to 55%; zinc, 6%; silver, 6 to 12 ozs.; gold, a trace. About 500 feet of tunnels and drifts on the property. Idle. Owner, Henry Lang, Tecopa.

Carbonate Mine (Lead-silver). Carbonate district, 42 miles north-west of Zabriskie. Near base of east slope of Panamint Mountains, at western border of Death Valley. Elevation 1200 feet. Water is hauled to mine from Zabriskie. The country rock is limestone, which has been greatly faulted. Diabase occurs as dikes intruding the limestone; basalt



Photo No. 51. Carbonate Mine and camp in Panamint Range, on the west side of Death Valley.

as surface flows. The ore, principally carbonate of lead, is deposited in irregular lenticular masses along a fault-plane. Width of ore body, 3' to 15'. Trend N. 10°-30° E. The greatest vertical depth below apex, 175 feet. Development consists of three tunnels, driven on the ore body. Upper tunnel 100' long, 60' below apex. Second tunnel 150' long, 30' on dip of vein (45°) below first. Lower tunnel (main working tunnel) 400' long, 100' below second. Ore is dumped into reserve bin below third tunnel, from which it is loaded into trucks. Hauled to Zabriskie in 4-ton motor trucks, at a cost of about \$15.00 per

ton. The trucks proved unsatisfactory and Holt caterpillar-type tractors have replaced them, at a lower hauling cost. About forty tons per week shipped to United States Smelting and Refining Company, Salt Lake. Ore shipped averages 35% to 40% lead, carrying $\frac{1}{2}$ oz. silver for each 1% of lead. Worked continuously since 1914; four men employed. Owned by the Carbonate Lead Mines Company; president, John Salisbury, Hotel St. Francis, San Francisco; manager, R. M. Jones, Zabriskie.



Photo No. 52. View of Zabriskie looking northward. Shipping point for Carbonate and Ibex Mines.

Cerro Gordo Mine (Lead-silver, Zinc). Situated near the summit of Cerro Gordo Peak, 8 miles by road east of Keeler. Elevation 8500 feet. As noted under Cerro Gordo district, the mine is a consolidation of the old Santa Maria and Union mines. Worked continuously from 1869 to 1876, and periodically up to 1907. Subsequently taken over by the Four Metals Mining Company, which erected a smelter east of Keeler and built an aerial tramway from the mine to the smelter. Company went into insolvency and litigation followed. In 1911, L. D. Gordon was granted a lease on all zinc deposits in the mine, and exploitation of the large zinc ore bodies on a commercial basis followed. The Gordon lease was operated continuously until September 18, 1915, and resulted in a large production of zinc ore. Upon the expiration of Mr. Gordon's lease it was taken over by the company and has been operated continuously since.

The country rock at the mine is fine-grained white marble, associated with some inter-stratified slate and a number of diorite and porphyry dikes. The lead-silver ore bodies are lenticular masses enclosed in marble near the contact with the dikes and occasionally have a slate



Photo No. 53. Hoisting plant and head of aerial tram of Cerro Gordo Mine, Inyo County.

footwall. They trend in a general NE. direction, dipping SE. 70° to 80° . The San Felipe vein, containing tetrahedrite, azurite and malachite, in a gangue of quartz and barite, cuts across the lead-silver ore bodies, trending N. 20° W. and dipping 70° SW. The zinc ore, smithsonite, forms irregular masses along the limestone footwall of the old lead stopes. Its presence was unsuspected until its discovery in 1907.

Development: There are said to be over 28 miles of tunnels and drifts in the Cerro Gordo mine. The ore now mined is worked through the Belshaw shaft, 900 feet deep, with levels at 200', 400', 550', 700' and



Photo No. 54. View westward from Cerro Gordo Mine, showing camp, dump, head of tramway, and old slag dump. Owens Lake and Mt. Whitney Range in the distance.

900'. From the 900-foot level a winze was driven 250 feet deep. Work during the past few years has been confined to mining the zinc ores in the old stopes above the 500-foot level.

Net earnings of the company for a period of five months ending February 29, 1916, amounted to \$40,260, according to the report submitted to the stockholders. This is said to have been made principally from shipments of zinc.

A large body of zinc ore has been opened up above the 200' level since the mine was visited in May, 1916.

Electric power was installed at the mine in January, 1916, supplied by the Southern Sierras Power Company. Equipment consists of a 100 h.p. electric hoist, Ingersoll-Rand compressor of 640 cubic feet capacity, and 100 h.p. oil-burning boiler to operate old steam plant in case of breakdown of power line. A Leschen aerial tramway, 29,560 feet long, carries the ore to the railroad at Keeler. Capacity of tramway 16 tons per hour. Twenty tons of ore, averaging not less than 28% zinc (no lead or silver), are shipped daily to United States Smelting and Refining Company at Salt Lake. Sixty men are employed. Owned by the Cerro Gordo Mines Company, First National Bank Bldg., San Francisco; L. D. Gordon, vice president and general manager; J. C. Climo, superintendent.

(See Bibl. Cerro Gordo District.)

Christmas Gift Mine (Lead-silver). Darwin district, 2 miles north of Darwin. Elevation 5300 feet. Adjoins the Lucky Jim Mine. Idle. Owner, L. D. Skinner, Lone Pine, Cal.

BIBL.: Rept. VIII, p. 226; Rept. X, p. 211; REPT. OF THE DIRECTOR OF THE MINT, Precious Metals in U. S., 1883-1884; U. S. G. S. Bull. 580-A, pp. 10-12.



Photo No. 55. Christmas Gift Mine, near Darwin.

Cliff Mine (Silver). Kearsarge district, 12 miles west of Independence. Elevation over 8500 feet. Inaccessible 6 months during the year. No work done for forty years. Owned by John Naylor of Independence. For details of the Kearsarge district, see Ross Brown's Report in Mineral Resources West of Rocky Mts., 1868, p. 177, and Report of Director of Mint, 1883, p. 157.

Cliff Mine. Deep Spring district. A silver mine 5 miles south of Oasis, Mono County, but in the White Mountains of Inyo County, is reported to have been leased to Ed. J. King and J. C. King of San Francisco. The mine includes a large acreage and a large dump of good ore. It is reported that considerable ore has been blocked out by the old workings. It is proposed to haul the ore to Coaldale, Nevada, by motor trucks.

Columbia Mine (Lead-silver). Darwin district. Idle for many years. Recently taken over by the Darwin Development Co., which is to develop it in connection with their other properties in that vicinity.

Bibl.: Adolph Knopf, U. S. G. S. Bull. 580, pp. 17, 18.

Custer Mine (Lead, Silver, Gold). Darwin district, 1 mile east of Darwin. Elevation 4100 feet. The ore, principally lead carbonate and



Photo No. 56. Custer Mine, Darwin.

galena, is found in bunches in a large irregular body of coarsely crystalline calcite. Fluorite occurs associated with the ore, or in the vicinity of the ore pockets, and its presence serves as a guide in the exploration for ore. Pyrite occurs in the calcite, and on the 400-foot level large bunches of it are exposed. The development consists of a 400-foot incline shaft, with levels at 100', 200', 300', and 400'. Equipment con-

sists of a 15 h. p. gas engine hoist and a 3-drill air compressor. The mine is said to have produced over \$250,000 on ore averaging 30% lead, 150 to 200 ozs. silver and \$4.00 in gold. Three men employed. Drifting is being carried on along the 400-foot level. The mine is under lease to Frank H. Long and Charles Grimes, of Pasadena; John H. Thorndike, manager.

Bibl.: Reg. of Mines, Inyo County, 1902; Adolph Knopf, U. S. G. S. Bull. 580, pp. 15, 16.

Daisy Mine (Lead-silver). Twenty-six miles south of east of Big Pine in the Waucoba unorganized district. On the east flank of Inyo Mountains. Elevation 7575 feet. Auto road to mine from Big Pine



Photo No. 57. Shaft at Daisy Mine on the east flank of the Inyo Mountains.

(Saline Valley road). Fissure vein in limestone, varying from 6" to 2' wide. The ore is essentially coarsely crystallized galena and some lead carbonate, in a quartz and quartzite gangue. Vein strikes N. and S., dips steeply to the west. Sinking shaft on vein to a depth of 100 feet. Several prospect tunnels driven on vein, which can be traced along surface for several thousand feet. Hand drilling. Four men employed. Development work only. Owners, Hercules Mining Company, (Incorporated for 1,000,000 shares @ 10¢ share), Wallace, Idaho. Manager, D. T. Bedell.

Defiance Mine (Lead-silver). Darwin district. Idle since 1910. Owned by Patrick Reddy Estate, Wm. Metson, Monadnock Bldg., San Francisco, trustee.

Bibl.: REPT. OF THE DIRECTOR OF THE MINT, Precious Metals in U. S., 1883-1884; Rept. VIII. p. 226; X, p. 211; XII, p. 24; U. S. G. S., Bull. 580-A.

Gibraltar Mine (Lead-silver). South Park district, SE. of Ballarat in the Panamint Mountains. Elevation approximately 7000 feet. Ore occurs in lenses in limestone; 30% lead-carbonate ore, carrying 20 ozs. silver. Shipped by way of Trona by the Trojan Mining Company of Seattle, who formerly owned the mine. Owned by Domingo and Clairen, Ballarat, Inyo County, Cal.

Gunsite Mine (Lead-silver). Resting Springs district, 7 miles east of Tecopa. Elevation 2350 feet. Spur track, of the Tonopah and Tidewater Railroad, to the mine from Tecopa. The country rock is dolomite,



Photo No. 58. View eastward of Gunsite Mine and camp of Tecopa Consolidated Mining Co., 7 miles southeast of Tecopa.

overlying quartzite. The ore is deposited in a vein, varying up to 20 feet in width, in the dolomite. Strike N. 45° W., dip N. 35°-50° E. The ore is principally carbonate of lead, with occasional stringers of galena. The vein matter is decomposed lime and iron oxides which are very easy to mine by hand work. A 1000-foot incline shaft has been sunk on the vein, with levels every hundred feet along the incline. Considerable drifting has been done on the 4th and 7th levels. The 4th level connects with the surface and is at present the main working tunnel. Equipment consists of a 73 h.p. gas engine and 15 h.p. Fairbanks-Morse hoist. The company owns and operates a locomotive for hauling ore and supplies from the mine to Tecopa. The ore averages from 7% to 12% lead, 7 to 12 ozs. silver, \$1.50 in gold, and is shipped to the smelters at Salt Lake. A 75-ton concentration mill is being installed near the Amargosa River, just south of Tecopa and includes a Ball mill, tube mill, jigs and Wiltley tables. A distillate engine supplies power. The mine was discovered and first worked in 1865. A smelter erected in the district a few years later now lies in ruins. Idle for many years.

Taken over and operated continuously since 1912 by the present company; fifteen men employed. Adjoins Noonday Mine, owned and operated by same company. Owners, Tecopa Consolidated Mining Company, L. D. Goodschall, vice president and general manager, Tecopa, Cal.

Bibl.: REPT. OF THE DIRECTOR OF THE MINT, Precious Metals in U. S., 1883, p. 166.



Photo No. 59. Main working level of Gunsite Mine.

Hiram Shaw is working a lead-silver prospect 15 miles northeast of Shoshone in the north end of the Nopah Range. No production.

Ibex Mine, or Arcturus (Lead-silver, Zinc). Situated in the Black Mountains, 16 miles southwest of Zabriskie and 6 miles north of Saratoga Springs. Elevation 1300 feet. Although this property is recorded in Inyo County, it is actually located in San Bernardino County.

The deposit is a vein, averaging 3' to 5' wide, in dolomite. Strike N.-S., dip E. The vein can be traced on the surface along its strike for 1800'. The ore is argentiferous galena and carbonates of lead and zinc. Occasional bodies of anglesite and linarite are associated with the galena. Shipping ore is said to have averaged 44% lead, 33% zinc, 16 ozs. silver and \$16.00 in gold. Development consists of 4 tunnels, the longest being 100 feet on vein. Mining at present is confined to gouging out rich ore bodies near the surface; 19 men employed at \$4.00 per shift. Ore is sacked at the tunnels and packed on burros down to the camp where it is transferred to a 4-ton Kelly quad motor truck, which hauls it to Zabriskie. From 7 to 8 tons are produced daily. Located September,

1914. Worked since January, 1916, by the Ibex Spring Mining Company, of which S. F. Brock is manager. Property recently reported purchased by the Goodsprings Mining Co., of Nevada.



Photo No. 60. Mine dumps and compressor plant at Ibex Mine, 15 miles west of Zabriskie, in Amargosa Range.

Ignacio Mine (formerly Saint Ignacio), (Lead-silver). Cerro Gordo district, 6 miles by road east of Keeler. Elevation 7800 feet. The deposit is a well-defined quartz, fissure vein in limestone. Strike N.-S., dip E. Average width 8' to 10'. The ore is essentially argentiferous galena, which in places is oxidized to the carbonate. Linarite, the double

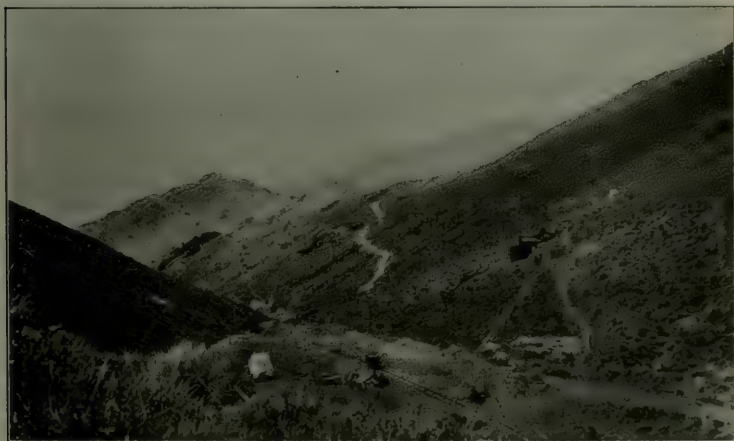


Photo No. 61. Ignacio (in foreground) and Ventura Mines in Inyo Mountains, 1 mile below the Cerro Gordo Mine.

sulphate of lead and copper, is occasionally found with the galena, but not in commercial quantities. Development consists of a 500-foot shaft and a 2000-foot main working tunnel. Considerable drifting and stoping has been done. The mine was first worked from 1867 to 1882 but has been idle for many years and was taken over by the present owners in 1915. Work is confined to stoping above the main tunnel; and 7 men are employed. The first-class ore is hauled by team to Keeler, at a cost of \$2.50 per ton, and shipped to Salt Lake. Second-class ore is trammed to a mill below the tunnel. The mill consists of one 9" x 15" Blake crusher; five 750-lb. stamps; one Wilfley concentrator; one Robertson concentrator; three separate gas engines used to operate makeshift plant. Mill operated one shift daily, crushing 6 tons. Concentrates shipped to smelter. Owned by the Ignacio Mining Company; president, P. M. Price, San Diego, Cal.; superintendent, F. C. Everett.

Bibl.: R. W. Raymond, MIN. RESOURCES W. OF ROCKY MTS., 1870, p. 17; S. M. B. Reg. of Mines, Inyo County, 1902.

Independence Mine (Lead-silver). Darwin district, adjoins the Defiance Mine and is of the same ownership, the Estate of Patrick Reddy. Idle.

Bibl.: REPT. OF DIRECTOR OF MINT, Precious Metals in U. S., 1883, p. 164; 1884, p. 103. STATE MINERALOGIST REPT., VIII, p. 226; X, p. 211; Reg. of Mines, Inyo County, 1902; U. S. G. S. Bull. 580, pp. 14, 15.

Lane Mine (Lead-silver). Darwin district, Sec. 13, T. 19 S., R. 40 E., M.D.M., 2 miles NE. of Darwin, on east flank of Darwin Hills. Elevation 4100 feet. Well defined vein, inclosed in lime, varying up to



Photo No. 62. Old smelter and hoist at Lane Mine near Darwin. Property of Darwin Development Co.

20 feet in width. Strike N. 65° E., dip 80° – 85° N. The ore, galena and lead carbonate, occurs in bunches in the vein. Gangue, fluorite and calcite. Some veinlets of chrysocolla are exposed in the lowest workings of the mine. Mine is opened by two shafts, 300 feet apart, 750' and 725' deep, respectively. Levels at each 100 feet in depth connect the shafts. There are over 2000 feet of drifts in the mine. A 12 h.p. gas engine hoist is installed at one shaft and a 30 h.p. steam power hoist at another. A 25-ton capacity single stack, water-jacket blast furnace erected here several years ago; operated only a few months. A Murex



Photo No. 63. Excavating for Murex Concentration Mill at Lane Mine, near Darwin.

oil concentration mill is being installed to treat second-grade ores of the group of mines operated by this company. The capacity of this mill is said to be 25 tons and will be ultimately increased to 250 tons.

The mine is said to have produced \$500,000. Actual development will be undertaken upon completion of the mill. Owners, Darwin Development Co., 71 Broadway, New York; F. N. Weeks, consulting engineer.

Bibl.: Rept. XII, p. 24; Rep. XIII, p. 32; U. S. G. S. Bull. 580-A.

Lee Mine (Emigrant Mine), (Lead-silver, Zinc). Lee district, east of Cerro Gordo, 26 miles by auto road from Keeler. Said to have produced lead ore rich in silver. Under lease to J. R. LeCyr, of Lone Pine,

who is working two men on a zinc deposit exposed in old workings. Owned by Dr. I. J. Woodin and William Skinner of Independence, Cal.

Bibl.: REPT. OF DIRECTOR OF MINT, Precious Metals in U. S., 1883, p. 163.

Lucky Hike Prospect (Lead-silver). Located in the Waucoba unorganized district, 28 miles east of Big Pine. Elevation 7060 feet. Some large bunches of galena found in quartz croppings along top of low hogbacks. Country rock, calcareous slate and schist. Formations shattered and quartz does not appear to be in place. Driving crosscut

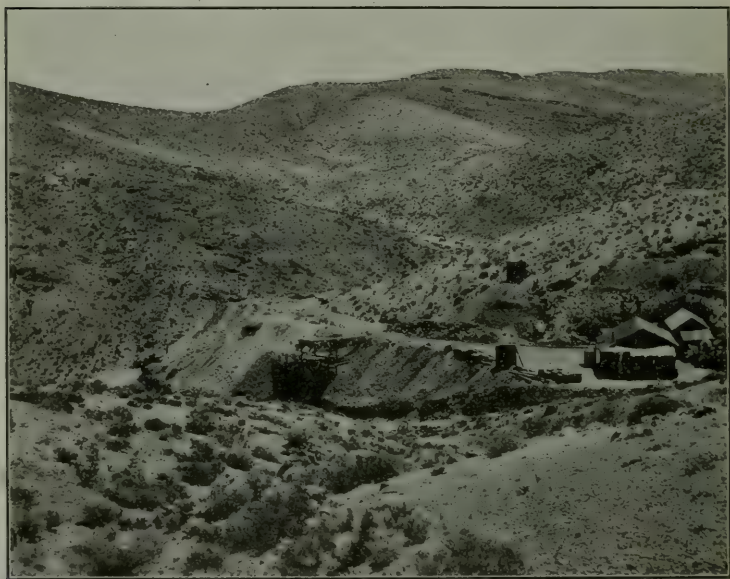


Photo No. 64. Lucky Jim Mine, near Darwin.

tunnel at base of hill, hoping to strike vein in place; 3 men employed. Owners, Lloyd Bedell, F. M. Bedell, V. Richardson, Big Pine, Inyo County, Cal.

Lucky Jim Mine (Lead-silver). Darwin district, 2 miles north of Darwin, adjoins the Christmas Gift Mine. Good auto road to Keeler, 24 miles distant. The country rock limestone intruded by a porphyry dyke. The vein cuts across lime beds striking N.-S. and dipping 65° to 80° W. The ore consists principally of the oxidized ores of lead carrying a little silver but no gold. Galena occurs in bunches in the vein. The mine is operated by a 300-foot vertical shaft, and a 300-foot incline shaft 600 feet from the bottom of the vertical shaft. Drift levels are driven

about every hundred feet. Considerable stoping on the vein has been done above the 300-foot level. The ore body is now being stoped below the 300-foot level. It is the intention of the company to sink the vertical shaft to the 600-foot level, or deeper, to avoid handling ore twice in hoisting. The vertical shaft is equipped with a hoist run by a distillate engine. Incline shaft from 300-foot level equipped with compressed air hoist; 25 h.p. Diesel type engine to operate 32 h.p. compressor. Machine drills are to be installed in mine. Some 30 men are employed. From 8 to 10 tons of first-class ore (averaging \$40.00 lead and silver) are hauled daily, with Knox tractor, to Keeler. The ore is shipped to Salt Lake. An aerial tramway is to be built to the Lane mill, where the low-grade ores will be concentrated. The mine was located in 1874 and taken under bond and lease by the present company in December, 1915. Said to have produced \$1,500,000. Darwin Development Co., 71 Broadway, New York; F. N. Weeks, general manager; J. E. Rea, Superintendent.

Bibl.: MIN. RES. W. OF ROCKY MTS., 1876, p. 25; REPT. OF DIRECTOR OF MINT, Precious Metals in U. S., 1883, p. 163; STATE MINERALOGIST REPT. VIII, p. 226; X, p. 211; XII, p. 24; Reg. of Mines, Inyo County, 1902; U. S. G. S. Bull. 580, pp. 12, 13.

Minneatta Mine (Lead-silver, Zinc). Located in the Lookout (Modoc) district 28 miles north of Trona. East slope of Argus Mountains. Elevation approximately 3000 feet. Under lease to Grim and Sexton, of Los Angeles, Cal. Present work confined to mining zinc carbonate exposed in old stopes. Ore hauled to Trona in 2½-ton motor truck, making one trip daily. Twelve men are employed. Owned by J. J. Gunn, Independence, Cal.

Bibl.: R. W. Raymond, MIN. RES. WEST OF ROCKY MTS., 1876; p. 32; Rep. X, p. 212.

Modoc Mine (Lead-silver). Lookout district, 30 miles north of Trona, 2 miles north of the Minneatta Mine. Elevation 3500 feet. Idle for many years.

Bibl.: Rept. XII, p. 24; Rept. XIII, p. 32; Reg. of Mines, Inyo County, 1902; REP. OF DIRECTOR OF MINT, Precious Metals in U. S., 1883, p. 164; 1884, p. 104.

Monster Mine (Lead-silver). Situated on the east slope of the Inyo Mountains, northwest of the Saline Valley. Located in 1907. Large body of argentiferous galena mined. No work for several years. Relocated January 1, 1916, by Frank Butler and Sam Watson, of Big Pine, Inyo County, Cal. Idle.

Bibl.: Adolph Knopf, U. S. G. S. Bull. 540, p. 111.

Montezuma Mine (Lead-silver), is 10 miles by road southeast of Big Pine on the western slope of the Inyo Range. Elevation 4700 feet.

The country rock is limestone and slates, which have been greatly shattered and faulted. The vein follows the trend of a major fault, NW.-SE. The ore is chiefly lead carbonate, in a gangue of iron oxide and decomposed lime. Galena in a quartz gangue is also encountered. Development consists of two tunnels, the lower driven to crosscut the vein. Greatest depth on vein 240 feet. The ore is trammed to a reserve bin at the camp in 1-ton cars, operating on a 3-rail gravity tramway 1000 feet, on a 30° incline. Teamed to Elna, a station 2 miles east of the mine on the California and Nevada railroad. Four trips are made daily carrying 2½ to 3 tons per load. A furnace erected at Elna in the early eighties has been dismantled. The ore is shipped to the Salt Lake smelters. Ten men are employed at \$3.50 per day. The mine is bonded to John Mitchell, Lone Pine, Cal.

Bibl.: REPT. OF DIRECTOR OF MINT, Precious Metals in U. S., 1883, p. 158; 1884, p. 100; S. M. B. Rept. XIII, p. 32; Reg. of Mines, Inyo County, 1902; U. S. G. S. Bull. 540, pp. 109, 110.

Nancy Hanks (Lead-silver). Located in the Waucoba unorganized district, 28 miles by road southeast of Big Pine, on east flank of Inyo



Photo No. 65. Entrance to Nancy Hanks Mine, on the east flank of the Inyo Mountains.

Mountains. Elevation 8250 feet. The ore is a quartz vein, carrying bunches of coarsely crystalline galena, in a formation of limestone and shale. The country rock, as exposed in a 60-foot tunnel driven on the vein, is crushed and shattered and the vein does not appear to be in place but lies flat along this crushed zone. The property is difficult of access and is reached by the Big Pine road to the Daisy mine and by

trail from the Daisy mine two miles up a ridge. Located January, 1916; started development April 1, 1916. There were 3 men employed. Owned by George B. Warren, Big Pine, Cal.

Noonday and Grant Mines (Lead-silver, Zinc). Located in the Resting Springs district, 9 miles southeast of Tecopa and 2 miles south-east of the Gunsite Mine. Elevation 2880 feet. Railroad spur to Noon-day Mine. The deposit is a continuation of the Gunsite vein, striking N. 40° W., dip 45° NE. The ore is in general the same as that at the



Photo No. 66. Noonday Mine, Tecopa Consolidated Mining Co.

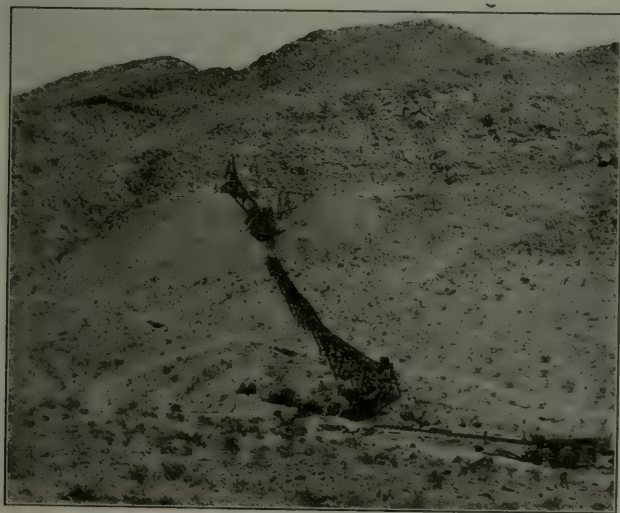


Photo No. 67. Gravity tram and ore bin at Noonday Mine.

Gunsite mine, but some zinc carbonate is found in the upper tunnel. The mine is opened by a 400-foot incline shaft and 3 tunnels. Upper tunnel, called the surface tunnel, at collar of shaft, is 400 feet long. The second tunnel on the 100-foot level is 400 feet. The main working tunnel, or 200-foot level, is 200 feet in length. The main working tunnel is driven through the hill to connect with the Grant Mine. The latter is situated 900 feet across a gully from the south portal of the main tunnel. A 60-foot shaft has been sunk at the Grant and drifting has been done along the vein at the bottom of the shaft. Ore is trammed to storage bins at the railroad through the Noonday tunnel. Fifteen men



Photo No. 68. Old Tecopa Smelter, south of Noonday Mine. Kingston Range in the distance.

employed at \$3.50 per day. From 500 to 1000 tons of ore have been shipped to a Salt Lake smelter from the group of mines operated by the Tecopa Consolidated Company since 1912. Second-class ore (lower than 6% Pb) will be concentrated upon completion of the mill. (See Gunsite Mine).

Opal Mine (Lead-silver). Waucoba unorganized district, 26 miles southeast of Bishop and adjoining the Daisy Mine. Elevation 7160 feet. Two parallel veins, about 100 feet apart, striking N. 20° W., dip 30°, are inclosed in limestone. The veins are 18" wide and carry galena. Development consists of four 30 foot to 50 foot shafts sunk on the two veins. Idle. Worked for assessment only. Owned by Walter Bird and Russel Steward, of Big Pine, Cal.

Ophir Mine (Lead-silver, Zinc). Situated 10 miles northeast of Trona, at the base of the Slate Range. Elevation 2100 feet. The ore body consists of a vein, varying in width from 6" to 4', inclosed in limestone. The vein material is highly oxidized, containing essentially carbonates of lead. Galena occurs occasionally as bunches in the vein. Zinc carbonate occurs in the walls, but mining has been chiefly carried on in the lead ores. The ore is said to average 40% Pb, with a few ozs. of silver. The mine is opened by a 120-foot 60° incline shaft



Photo No. 69. Ophir Mine, 4 miles east of The Tanks, southern Inyo County.

on the vein. Drifts are being driven at the 60-foot and 100-foot levels. The shaft is equipped with a 12 h.p. gas engine hoist. Mining with auger drills; 4 men employed. Opened November, 1915, and worked continuously since. Ore is hauled to Trona in three 2½-ton motor trucks, making two round trips daily. Owners, T. Thorkildsen and T. H. Rosenberg, 320 Trust and Savings Bldg., Los Angeles, Cal.

Promontory Mine (Lead-silver). Located in the Darwin district, 1½ miles south of Darwin. Elevation 5000 feet. Wagon road to mine. The ore body is highly oxidized and inclosed in lime. Strike N. 20° W., dip 30°. The ore consists of lead carbonate and galena. Opened to a depth of 320 feet on the vein by an inclined shaft. Five levels. It was impossible to estimate the amount of work done, since the shaft is caved below the 180-foot level. Present work is confined to drifting on the 180-foot level. The hoist is run by a 6 h.p. gas engine. The mine was first worked in 1874 and taken over in December, 1915, by the present

company, which is developing it in connection with their other mines. Four men working. Darwin Development Company, 71 Broadway, New York.



Photo No. 70. Promontory Mine, near Darwin. Darwin Development Co.

Raven Mine (Lead-silver). Ubehebe district, 60 miles southwest of Bonnie Claire, Nevada, and 5 miles north of Dodds Springs. Elevation 3800 feet. A tunnel is being driven in hard white limestone, to cut a vein which outcrops on the mountain several hundred feet above. The tunnel was 300 feet long when visited. Over 1500 feet of tunnels, mostly crosscuts. Several stringers of good ore encountered. Thirty tons of ore, averaging 60% lead, ready for shipment. Two men working. Owned by J. Crcok and A. Farrington of Big Pine, Cal.

Redwing Mine (Lead and Zinc). Resting Springs district, 4 miles northeast of Shoshone, on west slope of Resting Springs Mountains. Vein, containing carbonates of lead and zinc, inclosed in limestone. Opened to a depth of 90 feet, on 45° incline. Drifts east and west of shaft at 20-foot level. Formerly mined only for lead. Now being mined for zinc ores by R. M. Jones of Zabriskie. Owned by R. J. Fairbanks of Shoshone, Inyo County, Cal.

Royal Group (Spear Mine), (Lead, Silver and Zinc). Cerro Gordo district, 1 mile north of Cerro Gordo Mine, along top of ridge 8 miles east of Keeler. Elevation 8400 feet. Claims: Lead King, Lead Queen, Lead Prince, Princess, Dutchess, Czar, Bluff. Development consists of a 100-foot incline shaft with 100' drift on 50-foot level and 175' drift on

100-foot level. Equipped with 6 h.p. gas engine hoist. Fifty-foot winze sunk from 100-foot level, and 75' drift from bottom of winze. The ore occurs as galena, lead carbonate and zinc carbonate as replacement along contact of limestone with diorite dikes. Said to have produced 1000 tons of lead-silver ore that averaged 35% to 40% lead, 35 to 40 ozs. silver, \$2.00 to \$3.00 gold. The zinc ore runs 40% and over. The ore body varies from 1 to 15 feet thick and strikes NW.-SE. Idle. Worked for assessment only. Owned by R. C. Spear of Lone Pine, Cal.

Santa Rosa Mine (Lead-silver). Lee district, east of Cerro Gordo and 26 miles by road from Keeler. Elevation 7000 feet. The country rock is limestone, intruded by coarsely crystalline porphyritic dikes.



Photo No. 71. Santa Rosa Mine.

The ore is deposited in veins along the limestone and igneous contacts. There are two systems of veins, the principal one trends N.-S. and the lesser one E.-W. Average width 4 feet. Ore is galena, with its oxidation products, chiefly lead carbonate. The E.-W. veins carry oxides of copper in small amounts, as well as lead. The many excellent outcrops of rich ore bodies would indicate a high degree of mineralization; however, the ore bodies are apparently superficial. Many shafts have been sunk

on the different outcrops, but the values do not continue with depth. The mine is opened by a main tunnel 200 feet long, 240 feet below a very promising outcrop. Many drifts, crosscuts and upraises were driven from the tunnel, but the rich ore was in all cases found close to the surface. Mine idle for several years, reopened April, 1916. The dump below the main tunnel is said to average 13% lead, with 1 oz. silver for each 1% of lead. Work consists of hand-sorting the ore from the old dumps and doing some drifting in the main workings; 4 men employed. Ore hauled to Keeler, at \$6.50 per ton, and shipped to smelter. J. H. Price, superintendent. Owners: Independent Lead Silver Mining Company, Syndicate Bldg., Oakland, Cal.

Silver Reef Prospect (Lead-silver). South Park district, 6 miles east of Ballarat, near summit of Panamint Range. Ore is said to vary from 2% to 18% lead and carries from 12 to 98 ozs. silver. Development consists of 16 open cuts, one 16-foot shaft and a 26-foot tunnel along the vein. Idle. Owner, J. A. Gilliam, Ballarat, Cal.

Silver Rule Mine (Lead-silver, Zinc), recorded in Inyo County, is actually in San Bernardino County, about $\frac{1}{4}$ of a mile south of Inyo County line. Seventeen miles east of Morrison's Siding, on the Tonopah and Tidewater railroad, on the north flank of the Kingston Mountains. Elevation 4600 feet. Ore body contains carbonates of lead and zinc. Opened by two tunnels, the upper 220 feet, the lower 120 feet. Formerly worked for the lead-silver ores. About 140 tons shipped during 1910, which averaged 48% lead, 26 ozs. silver, \$0.60 gold per ton. The unsuspected zinc ores were thrown on the dumps. Three men employed sorting the zinc ore from the old dumps. Packed on burros to camp at Crystal Springs, at \$3.00 per ton and hauled by team to railroad at \$5.00. About 30 tons ready for shipment. Owner, John Chambers, Tecopa, Cal.

Troeger's Tunnel, Cerro Gordo district, is 4.7 miles by road east of Keeler, on the west flank of Inyo Mountains, below the Cerro Gordo Mine. Elevation at tunnel 6010 feet. The tunnel, started in 1909 and now 6700 feet long, is being driven to crosscut the San Felipe vein, which outcrops 2500 feet above. Strike of tunnel N. 57° E. Formation, limestone. At 3700 feet from the portal a fault zone about 150 feet in width was encountered. This zone is traversed by numerous quartz stringers, which contain small amounts of tetrahedrite, galena, sphalerite and pyrite. Drifts were driven for several hundred feet both N. and S., from the tunnel, along this zone. At 6000 feet from the portal a narrow quartz vein was encountered carrying sulphides of copper and lead. The owners expect to cut the San Felipe vein within another 100 feet.

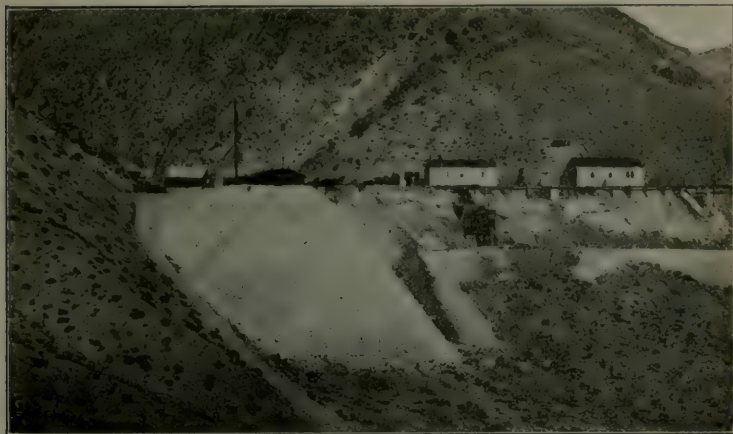


Photo No. 72. Troeger Tunnel of the Estelle Mining Co., east of Keeler.

Equipment consists of 32 h.p. distillate engine, air compressor and machine drills. Water is piped by gravity, 10,000 feet, from mountain springs to the plant. No production; 4 men employed. Owned by the Estelle Mining Co., 310 South Grand St., Los Angeles, Cal., R. C. Troeger, general manager and secretary.

Bibl.: Adolph Knopf, U. S. G. S. Bull. 540, p. 110.

Ubehebe Mining Company (Lead-silver). Ubehebe district, 52 miles by road southwest of Bonnie Claire, Nevada. Elevation 3930 feet. The country rock is limestone, intruded by diorite dikes. The deposit is an irregular lenticular replacement in the limestone, varying up to 15 feet in width. The ore consists principally of oxidized ores of lead, carbonate and lead sulphate, with occasional bunches of galena. Development consists of two tunnels, the upper 60 feet long and the lower, connected by a 50-foot winze, 100 feet long. No ore has been encountered in the lower tunnel. The upper tunnel is in an ore body which appears to have been faulted from the main deposit, croppings of which appear along the summit of a low ridge several hundred feet above the mine. Some ore was shipped from these main upper deposits after the mine was visited. The displaced ore body was being worked when visited, and was practically worked out. Ore is hauled by contract to Bonnie Claire; two Yuba tractors of 10-ton capacity were being used. Round trip made in 52 hours. Said to haul the ore at a cost of \$8.00 per ton. Mine worked since November, 1915. Up to April the mine had produced 200 tons of 60% lead ore. Three men employed. Owner, W. W. Waterson, Bishop, Cal.

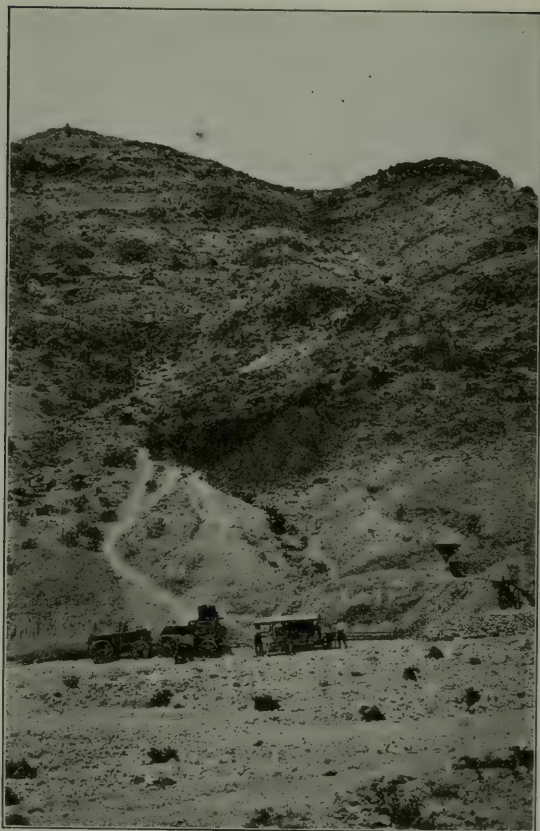


Photo No. 73. Ubehebe Lead Mine, and tractor for hauling ore 52 miles to Bonnie Claire, Nevada.

Ventura Mine (Lead-silver). Cerro Gordo district, $6\frac{1}{2}$ miles by road east of Keeler. Situated on the western flank of the Inyo Mountains, below the Cerro Gordo Mine. Elevation 7800 feet. The country rock is limestone and diorite and the ore body is deposited along a fault plane in the limestone. The limestone beds strike N. 80° W. and the ore body strikes N. 35° W. The mine is opened by a 150-foot vertical shaft and a main working tunnel cutting the shaft at the 100-foot level. The main tunnel runs N. 35° E., then swings N. 35° W., and follows 125 feet along the fault. The ore is mainly lead carbonate and silver. Some zinc carbonates have been left unworked. The property was taken under 3-year lease on April 1, 1916, by H. G. Eldridge who is shipping

about 20 tons of ore per month, said to average 48% lead and 20 ozs. in silver per ton. Two men working. Owned by the Ventura Mining Company of New York.

MARBLE.

The marble deposits of Inyo County occur on the southwestern flank of the Inyo Range and extend for about 6 miles northeastward from Swansea station. The mountain range here consists of folded and faulted sediments of Carboniferous and Triassic age, altered by regional metamorphism to slates, quartzites and marbles, intruded by occasional basic dikes. The marble outcropping along the base of this range shows a thickness of at least 500 feet. The beds are tilted at a high angle, dipping northwestward into the mountain. They are fractured and faulted, so that the marble is considerably shattered at the surface. The marble is dolomitic, generally fine-grained, hard, and very resistant to weathering, as indicated by the sharp corners and fresh surfaces of the talus blocks. Three varieties are found, a pure white marble, a beautiful yellow marble and a variegated marble of white ground mass, penetrated by dendridic markings of manganese. The white marble is the one upon which most of the quarrying has been done. This takes a beautiful polish, as is exemplified by its use in the Mills Building, of San Francisco.

These deposits were first quarried in 1888 by the original Inyo Marble Company, of San Francisco, of which M. J. McDonald was president. The quarries lay idle for a number of years due to the shattered condition of the marble and the expense in obtaining large blocks. Assessment work was not kept up and the claims were relocated by the present owners, now known also as the Inyo Marble Company.

Inyo Marble Company, D. H. Dunn et al., of Los Angeles, have filed locations on twenty-four 160-acre claims, along the total length of the marble outcrops, including the property of the old Inyo Marble Company. A spur track of the California and Nevada Railroad runs to the quarry. Water for working purposes is obtained from artesian wells. There are three openings along the outcrop, the largest and most important of which produces the white marble. When visited, large talus blocks of this white marble were being hand broken and shipped 7 miles south to the plant of the Natural Soda Products Company for generating carbon dioxide. (See Dolomite.) A number of large blocks of the white marble were lying at the base of the quarry, ready for shipment, but no further work was being done.

Bibl.: Rept. X, 215; Rept. XII, 392; Rept. XIII, 628; Bull. 50, pp. 99, 100; MINING AND SCI. PRESS, July 20, 1912.



Photo No. 74. Marble Quarry of the Inyo Marble Co., north of Keeler.

MINERAL SPRINGS.

The descriptions of the mineral springs of Inyo County are here quoted from the report of Mr. Gerald A. Waring, "Springs of California," Water Supply Paper 338, issued by the U. S. Geol. Surv., 1915.

A few saline waters that are obtained from wells and lakes have become known as mineral-spring waters and therefore may be mentioned among the saline springs.

Castalian Mineral Water, which has been sold for medicinal use, has been obtained either directly from Owens Lake, in Inyo County, or from springs close to its shore. An analysis that is thought to represent the bottled water is here tabulated with analyses of water from Owens Lake. The analyses indicate that the waters are similar in character, if not identical, being primary saline and alkaline:

Analyses of Castalian Mineral Water and Water From Owens Lake, Inyo County, California.

(Constituents are in parts per million.)

	1		2		3		4	
Properties of reaction:								
Primary salinity -----	56		57		55		54	
Secondary salinity -----	0		0		0		0	
Tertiary salinity -----	0		0		0		0	
Primary alkalinity -----	44		43		45		46	
Secondary alkalinity -----	Trace		Trace		Trace		Trace	
Tertiary alkalinity -----	(?)		(?)		(?)		(?)	
Constituents	By weight	React- ing values	By weight	React- ing values	By weight	React- ing values	By weight	React- ing values
Sodium (Na) -----	29,300	1,273.5	21,660	941.7	26,840	1,167.0	81,180	3,530.0
Potassium (K) -----	1,188	30.4	2,750	70.4	1,548	39.6	3,448	88.2
Lithium (Li) -----			Trace	Trace			57	8.2
Rubidium (Rb) and caesium (Cs) -----			0	0			Traces	Traces
Thorium (Th) -----							Trace	Trace
Calcium (Ca) -----	Trace	Trace	Trace	Trace	13	.7	34	1.7
Magnesium (Mg) -----	Trace	Trace	Trace	Trace	4.7	.4	15	1.2
Iron (Fe) -----	Trace	Trace			9.2	.3		
Aluminum (Al) -----			Trace	Trace	12	1.3	(a) 48	5.3
Sulphate (SO ₄) -----	7,530	156.9	9,360	194.8	7,065	147.2	21,170	440.7
Nitrate (NO ₃) -----			Trace	Trace			948	15.3
Chloride (Cl) -----	20,200	569.7	13,440	378.9	18,220	514.0	52,900	1,462.0
Bromide (Br) and iodide (I) -----	Traces	Traces						
Sulphide (S) -----	325	20.3						
Carbonate (CO ₃) -----	16,710	557.0	13,132	438.4	16,500	549.9	(b) 48,880	1,687.0
Metaborate (BO ₂) -----	Trace	Trace	Trace	Trace	190	4.4	329	7.8
Arsenate (AsO ₄) -----							156	3.4
Phosphate (PO ₄) -----	Trace	Trace	Trace	Trace			238	7.5
Silica (SiO ₂) -----	245	8.1	164	5.4	207	6.9	297	9.7
	75,498		60,526		70,608.9		209,700	

(a) Iron and aluminum oxides expressed as aluminum. (b) Calculated.

1. Castalian mineral water. Analyst, Thomas Price (1880). Authority, U. S. Geol. Survey, Bull. 32.
2. Owens Lake. Analyst, Oscar Loew (1876). Authority, Wheeler report.
3. Owens Lake. Analyst, T. M. Chatard (1886). Authority, U. S. Geol. Survey, Bull. 60.
4. Owens Lake. Analysts, C. H. Stone and F. M. Eaton. Authority, Am. Chem. Soc. Jour., p. 1169, 1906.

Coso Hot Springs. Near the southwest corner of Inyo County there is a group of hot springs that are especially remarkable because of the acid character of their water. They have long been known as Coso Hot Springs, as they are on the eastern slope of the Coso Range. The main group is about 12 miles east of Haiwee railroad station, and is beside a road that leads eastward to Coso and other mining camps. The rocks of the region are largely granite, but this material is covered in some places by lava and lava craters of a recent geologic period of eruption.

At the principal spring, which is in granite material, in a pit about 50 feet by 100 feet in diameter and 10 feet deep, vapor and hot, sour

water rise through a white mud that is apparently formed by the decomposition from the rock. In summer the water in this pit is low, but in winter, as a result of increased condensation and decreased evaporation due to cooler weather, it is nearly half full.

The following analyses show that it contains unusually large amounts of sulphate of iron and aluminum, and silica. The most remarkable feature, however, is the high tertiary salinity. The discordance of the two analyses is apparently due, in part at least, to a change in the character of the water. In connection with the large iron and sulphate content, it is of interest to note that minute crystals, apparently of pyrite (iron sulphide), collect as a film on the water and also form on the clay at the side of the pool.

Analyses of Water From Coso Hot Springs, Inyo County, California.
(Constituents are in parts per million.)

	1		2	
Properties of reaction:				
Primary salinity -----	5		13	
Secondary salinity -----	5		18	
Tertiary salinity -----	90		69	
Primary alkalinity -----	0		0	
Secondary alkalinity -----	0		0	
Tertiary alkalinity -----	(?)		45	
Constituents	By weight	Reacting values	By weight	Reacting values
Sodium (Na) -----	49	2.13	81	3.52
Potassium (K) -----	11	.29	12	.31
Lithium (Li) -----	Trace	Trace		
Ammonium (NH ₄) -----	Trace	Trace		
Calcium (Ca) -----	45	2.25	59	2.84
Magnesium (Mg) -----	2.4	.20	34	2.80
Iron (Fe) -----	122	4.98	83	2.97
Aluminum (Al) -----	201	22.22	56	6.20
Hydrogen (H) -----	16	15.98	12	11.67
Sulphate (SO ₄) -----	2,308	48.05	1,400	29.18
Nitrate (NO ₃) -----	Trace	Trace	0	.00
Chloride (Cl) -----	Trace	Trace	40	1.13
Carbonate (CO ₃) -----	0	.00	0	.00
Metaborate (BO ₂) -----			0	.00
Phosphate (PO ₄) -----	Trace	Trace	Trace	Trace
Silica (SiO ₂) -----			411	13.59
	2,754.4		2,188	

1. Main spring. Analyst, Oscar Loew (1876). Authority, Wheeler report.
2. Main spring. Analyst and authority, F. M. Eaton (1910).

The place has become a camping resort for people afflicted with rheumatism, which is said to be relieved by baths in the hot mud. Bathing pits are dug in the cooler mud near the spring, and the material is worked up to the desired consistency. Close to the main spring is an area of steam vents, about 25 by 50 yards across, which contains several pools that furnish clear water for washing and cooking. This area also

furnishes sufficient heat for cooking, kettles containing food being placed in shallow pits, covered with sacks, and allowed to remain until the food is done.

Another area of hot vapors and mud in a ravine northwest of the main spring has been filed on as a placer claim for mining medicinal mud. The material at this place is somewhat finer in texture than that at the main spring.

Hot Springs near Tecopa. About 2 miles north of Tecopa railroad station two hot springs issue on alkaline slopes that border the eastern side of an alkaline marsh along Amargosa River. The springs rise in pits that have been dug about 10 yards apart, and their combined flow is about 225 gallons a minute. The observed temperatures were 108° and 109° F. Near the springs are heavy alkaline deposits of soda and common salt, and the water tastes noticeably, though not disagreeably, of the alkalies. In 1908 the water was piped to a railroad watering tank half a mile westward. It has also been used to some extent for bathing at a pool near the springs.

The water issues at the southwest base of a steep hill of quartzite that dips about 15° NE. The structure suggests that the hill forms part of a range that has been faulted and tilted in the manner characteristic of the Basin ranges and that the springs rise along the zone of fracture. Other warm seepages rise in marsh land a mile southward and probably have the same origin.

Hot Spring South of Bishop. At the base of the Sierra, about 8 miles south of Bishop a spring of considerable flow that is utilized for domestic supply and also for dipping sheep has a temperature of about 130°. Like the springs farther north, in Long Valley, its water has no distinctive taste nor odor and is probably mineralized in only small amount.

Volcanic rocks are present a few miles north of Bishop, and lava cones border the valley several miles south of the spring; but its water issues from granitic rocks, and the unusually high temperature seems more probably to be caused by rising from a considerable depth along a fault zone than by contact with masses of lava that have not yet cooled.

Poison Spring. This spring is on the western border of Death Valley, 7 miles northwest of the Furnace Creek ranch. It yields salty water that probably also contains sulphates, whose sickening effect on thirsty travelers has given the spring its name.

Salt Springs North of Furnace Creek Ranch. The sink or lowest portion of Death Valley, in the eastern part of the state, is crusted with impure salt, and at several places along its borders small springs issue whose waters are strongly saline. One group of springs of this character, is situated about 10 miles north of the Furnace Creek ranch

at the northeast border of Death Valley, where a slight amount of salty water issues.

Salt Springs South of Furnace Creek Ranch. About 4 miles south of the Furnace Creek ranch saline water forms a small wet area at the east edge of Death Valley. The flow is slight, and the water is too salty to be drinkable.

Vapor Vents West of Coso Hot Springs. Along the branches of a ravine 3 miles west of Coso Hot Springs there is an area several acres in extent in which much vapor issues, and the ground is impregnated with sulphur and alum, but in 1908 no water was flowing. A temperature of 203° , which is probably the boiling point at this elevation (about 4300 feet), was recorded in the vapor vents. These vents are in an area of lava where there are a number of small volcanic craters, and the surface is partly covered with fragments of pumice and obsidian. At the vapor vents the rock has been extensively altered by solfataric action and reduced to a siliceous sinter, but a mud similar to that at the Coso Springs was not observed. The difference is probably due partly to the fact that there is not sufficient water at the vapor vents to form a mud, and partly because they issue through lava, which does not become kaolinized as readily as does the granitic rock at Coso Hot Springs.

Warm Spring Near Little Lake. A small amount of lukewarm odorless water issues in a spring about 300 yards from Little Lake and near the base of a lava bluff 25 or 30 feet high. The spring has not been developed nor used to any extent during recent years and is known only locally. Perhaps the chief point of interest concerning it is its position with respect to the lava bluff. The primary alkaline and saline character of the water is shown by the following early analysis:

Analysis of Water From Warm Spring, Near Little Lake.
(Constituents are in parts per million.)

Properties of reaction:		
Primary salinity	-----	34
Secondary salinity	-----	0
Tertiary salinity	-----	0
Primary alkalinity	-----	51
Secondary alkalinity	-----	15
Tertiary alkalinity	-----	(7)
Constituents		
		By weight
		Reacting values
Sodium (Na)	-----	328
Potassium (K)	-----	Trace
Calcium (Ca)	-----	48
Magnesium (Mg)	-----	Trace
Sulphate (SO ₄)	-----	54
Chloride (Cl)	-----	163
Carbonate (CO ₃)	-----	327
Silica (SiO ₂)	-----	Trace
		920

Analyst, Oscar Loew (1876). Authority, Wheeler report.

Warm Springs in Panamint Valley. About 4 miles north of Ballarat, on the eastern edge of Panamint Valley, is a spring similar to the one in Saline Valley. Its water is tepid and is noticeably sulphuretted, and its yield is only about 40 barrels a day (1 gallon a minute). It forms a small watering place on a road leading northward from Ballarat.

Warm Spring in Saline Valley. There are a few thermal springs of minor importance in the desert region of eastern California. One of these springs is at the northeast side of Saline Valley, about 25 miles in a direct line east of Independence. It yields a small flow, and its water is not of high temperature. There are several cool springs a short distance westward from it and also to the southeast that form watering places in this part of the desert.

MOLYBDENUM.

Lucky Boy Prospect. Union district, 7 miles east of Kearsarge station on the east flank of the Inyo Mountains. Elevation 7000 feet. Molybdenum occurs scattered through a quartz vein along a contact between granite and limestone. A 15" vein can be traced for 500 feet along surface. The ore is said to contain 2.5% molybdenum. No production. Located April, 1916, by H. M. Myers and J. E. Brown, of Independence, Inyo County, Cal.

Molybdenum claims have recently been staked out by F. A. Campbell in the upper part of Lone Pine Creek. The molybdenite occurs as small flakes in a quartz gangue. The extent of the deposit is not yet known, as it is covered by snow during part of the year and has not been prospected.

NITER.

The existence of niter in the low, rolling hills along the Amargosa River has been known since the early eighties. The niter beds are situated in the southeastern part of Inyo County, extending across the boundary line into the northern part of San Bernardino County. The niter hills have a soft rounded surface and vary in size from 50 feet in height and covering a few acres, to several hundred feet in height and covering many acres.

Geology: The underlying rocks of the district are slates and schists of the Jura-Trias period, highly metamorphosed. Next above are early Tertiary clays, deposited during a long period of subsidence. The clays are bedded, on the upturned edges of the older rocks, in horizontal strata for a thickness of 800 feet. The formation of the niter-bearing hills occurred in the early Tertiary period and are the result of sedimentary marine deposits slowly accumulating in thin layers. These beds have been worn by erosive agencies into soft rounded hills and knobs.

The hills are covered with a crust or surface coating which is comparatively smooth and follows the contours of the hills. The crust, varying from a few inches to over a foot in thickness, is termed "caliche." The "caliche" contains the salines which have been concentrated on the surface as a "result of the upward capillary flow of water from below, induced by the constant and rapid evaporation at the surface in a comparatively rainless region."⁹ The niter is a very soluble white crystalline salt that readily permeates the clay. While the "caliche" contains a higher percentage of the niter, the clay layers underlying this crust also contain niter. This is due to the process of erosion and the wearing away of the clay beds by rains and floods. The niter is readily taken into solution and held by the underlying strata.

With the niter are associated sodium chloride, sodium sulphate, calcium sulphate, and magnesium sulphate. The proportions of the various salts vary as is shown in the following table, taken from Bull. No. 24.

	1	2	3	4	5
Niter -----	7.28	14.50	27.40	46.56	61.20
Sodium chloride -----	6.36	7.56	21.15	25.30	16.40
Sodium sulphate -----	.60	.70	2.05	5.30	3.10
Calcium sulphate -----	.20	.10	1.04	.30	.20
Magnesium sulphate -----	1.30	2.80	2.00	1.20	1.20
Insolubles -----	84.26	74.34	46.36	21.40	17.90
	100.00	100.00	100.00	100.00	100.00

The average from 104 samples of caliche taken from 104 claims in this vicinity was 9.54% niter.

Bibl.: Bull. No. 24, "The Saline Deposits of California," issued by the California State Mining Bureau.

Confidence Beds, consisting of 2400 acres, are situated along the south side of Death Valley at the "Narrows," northwest of Saratoga Springs. Analyses of caliche, as given by Gilbert Bailey, in Bulletin 24, show the highest per cent in niter to be 1.90 and the lowest as 0.76. An average of four samples was 1.7%. Undeveloped. These beds are held by the owners of the Valley, Round Mountain, Owl, and Saratoga Beds, of San Bernardino County. Owners, California Nitrate Development Company, 40 California St., San Francisco.

Bibl.: Bull. 24, pp. 165, 174.

⁹Gilbert E. Bailey, Bull. 24, p. 160.

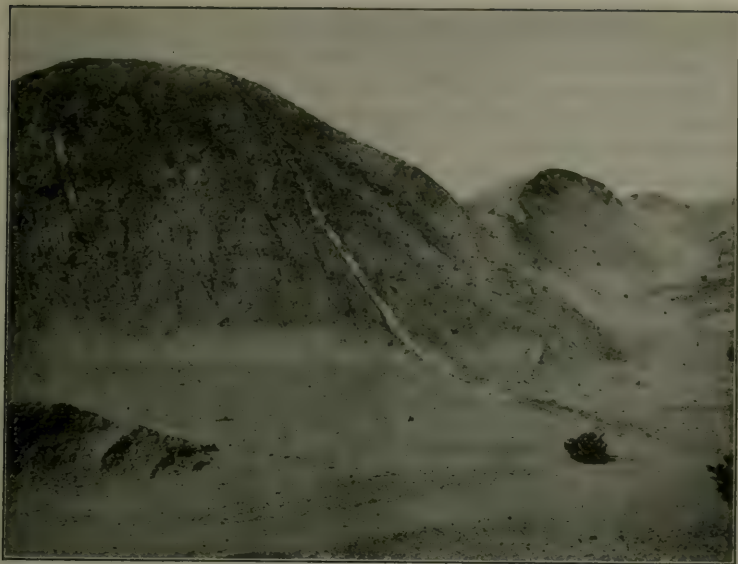


Photo No. 75. Niter beds south of Owl Springs, showing method of prospecting and doing assessment work. The beds strike N. 74° E.

Upper Cañon Beds. Resting Springs district. Situated along both sides of the Amargosa River on the Morrison Ranch and extending into San Bernardino County. These beds are easily accessible, as the Tonopah and Tidewater Railroad traverses the claims. Water for working purposes can be obtained in sufficient quantities from the Amargosa River. Beds prospected by digging trenches in the caliche, which varies from 6" to 18" in thickness. Present development shows from 5% to 10% niter. From 14 to 18 miles of trenches dug.

Gross tonnage as shown by trenches.....	328,500
Reduced to tons commercial.....	118,000
Value at \$50.00 per ton.....	\$5,900,000

Owned by the Pacific Nitrate Company, Consolidated Realty Bldg., Los Angeles; president, Walter R. Fales.

Bibl.: Bull. 24, pp. 165, 170-172.

POTASH.

The production of potash upon a commercial basis in Inyo County in the immediate future is probably assured, after much experimental work on the waters of Owens Lake. The composition of salts dissolved in waters of the lake was determined periodically from 1866 to 1914, under the direction of the United States Geological Survey. The

percentage of potash in the anhydrous residue of the salts is about 2.00 (See U. S. G. S. Bull. 580, p. 258).

Potash also occurs in small amounts in the saline deposits of Death Valley and Saline Valley. These deposits were prospected at different periods and often reported as being rich in potash. During 1912-1913, Mr. Hoyt S. Gale, of the United States Geological Survey, directed a series of tests of these saline deposits. The results of the tests of the Death Valley deposits are as follows:

Analysis of Surface Salt From Death Valley.
(George Steiger, Analyst.)

NaCl -----	94.54%
KCl -----	.31%
Na ₂ SO ₄ -----	3.53%
CaSO ₄ 2H ₂ O -----	.79%
Moisture -----	.14%
Insoluble residue -----	.50%
	<hr/>
	99.81%

Quoting Mr. Gale, "The solid material of the deposits underlying the lowest part of the valley to a depth of 100 feet may be assumed to average about 19% moisture, and after this has been dried out, the dried material averages about 65% of soluble salts. Of these soluble salts, only about 0.72% has been shown to be potash, or 1.13% potassium-chloride, the form in which the salt is doubtless present in this deposit." (For further detail on this deposit, see U. S. Geol. Surv. Bull. 540, pp. 407-415.)

The results of the tests for potash in the salt deposits of Saline Valley were practically negative, varying from .05% to 1.29% potash, of total salts. (See U. S. Geol. Surv. Bull. 540, p. 420.) This low content does not warrant the production of potash upon a commercial basis.

Inyo Development Company erected an experimental plant during 1915 for the manufacture of potash salts, at its soda plant on the shores of Owens Lake. The process was described in detail by Mr. Carl Elschner, chemist of the company, in the Mining and Scientific Press, issue of January 29, 1916. Briefly, it is as follows: The brine resulting from the precipitation of the sodium carbonate is concentrated in solar evaporating vats. In the vats it is exposed in layers of a few inches. The vats are arranged in such a way that the liquid, after partial evaporation, can be withdrawn from the crystallized salt crusts. The purpose of the evaporating and crystallizing process is to enrich the mother liquor with potash, and get out the other salts as free from potash as possible. Impure carbonate of sodium is first crystallized, and the solution drawn to another vat. The crystallization of NaCl

follows, and the liquid is drawn off again. Sudden precipitation, from oversaturated solutions, makes the process a complicated one, and care is necessary to see that no potash precipitates. The final solution contains sulphuric, carbonic, some boric, chlorine, potassium, and sodium ions. It is evaporated to dryness and the salt crusts resulting dried out and ground. The whitish potash fertilizer salts represent a mixture of the carbonates, sulphates, and chlorides of potash and soda, in varying proportions.

The first run of the experimental plant produced salts running 20.41% KCl; 2d run, 29.40% KCl; 3d run, 34.05% KCl. The plant is expected to be operating on a commercial basis within the year.

Natural Soda Products Co., have been experimenting on their brine, and are erecting a plant for the extraction of potash. We are not informed as to their "vacuum" process, which is a secret one, developed by Mr. Noah Wrinkle, secretary of the company, but await the results with interest.

QUICKSILVER.

Chloride Cliff Mine (see page 72). A vein in limestone containing cinnabar and metacinnabarite was recently discovered on one of the claims of this gold mine. A tunnel 80 feet deep driven on the vein exposed some fairly rich ore. No production. Idle. Owned by Crowell, Findley and Parsons of Rhyolite, Nevada.

SALT.

Sodium chloride is deposited as the major ingredient in the saline crusts of Death Valley, Saline Valley, and Salt Wells Valley, and in the waters of Owens Lake. It occurs in smaller amounts in the niter beds that border the Amargosa River. Salt was formerly produced as a by-product at the borax works of the Salt Wells Borax Company. The only production in the county is now from the Saline Valley deposits.

Bibl.: Bull. 24, "The Saline Deposits of California."

Owens Valley Salt Company has under lease from the Saline Valley Salt Company, 2000 acres in the lowest depression of the Saline Valley. It is 12 miles in an airline northeast of Swansea, where the company's mill is situated. The deposit is very inaccessible, but is usually reached from the railroad by trail over the Inyo Range. The Saline Valley road from Alvord up Waucoba Cañon is rather poor and roundabout.

The salt is deposited in an old lake bed covering several square miles. Of this area about one square mile is composed of a smooth, white salt



Photo No. 76. Mill and tramway terminal of Owens Valley Salt Company, 3 miles north of Keeler.



Photo No. 77. Sacking salt at plant of Owens Valley Salt Co.

crust, formed by dissolving the surrounding impure salt crust with water from a nearby spring, and recrystallizing it by solar evaporation. The recrystallized salt is said to 99.32% NaCl. It is harvested during the summer months and shipped, over an aerial tramway 13 $\frac{3}{4}$ miles in length, to the mill. The tramway, built by the Trenton Iron Works, is equipped with 800-lb. buckets, and is operated by electric power, as is the mill, supplied by the Southern Sierras Power Company. There are five stations along the line at which the buckets are automatically changed. Seventeen men are required for the tramway. Operated only during the summer months.

The mill treatment is as follows: The salt is shovelled into a bin which automatically feeds into a large rotary, oil burning, drying furnace. Subsequently elevated to rolls, where the salt is crushed to the desired sizes and passed over shaking screens to classify the different sizes. Five classes of salt are produced, varying from the natural crystallized rock salt to pulverized table salt. Approximately thirty tons are produced daily at a cost of \$2.75 per ton, segregated as follows:

Gathering salt in field.....	\$0.50
Tramming	1.50
Milling .....	.75

Forty men are employed in Saline Valley during harvest season, April to December. Thirty men are employed at mill throughout the year. Operated since May, 1915, by leasing company. Manager, W. J. Savage, American Bank Bldg., Los Angeles, Cal. Superintendent, John A. Lewis.

Bibl.: U. S. G. S. Bull. 540, pp. 416-420.

SODA.

The only soda produced in California is derived from the waters of Owens Lake. This lake lies between the Sierra Nevada Mountains on the west and the Inyo Range on the east and has no outlet. It covers an area of 97.2 square miles. The water is a dense brine, containing common salt, soda, borax, and other soluble salts. These soluble salts were evidently derived by the slow accumulation and concentration of the waters of the Owens River, which enters this basin from the north. A typical analysis of the composition of the salts dissolved in the lake

waters, as determined under the direction of the U. S. Geological Survey, is as follows (calculated to percentage of anhydrous residue) :

SPECIFIC GRAVITY 1.195.

Cl	-----	24.82
SO ₄	-----	9.93
CO ₃	-----	24.55
PO ₄	-----	.11
B ₂ O ₃	-----	.14
NO ₃	-----	.45
Na	-----	38.09
K	-----	1.62
Li	-----	.03
Ca	-----	.02
Mg	-----	.01
SiO ₂	-----	.14
Al ₂ O ₃	}	.04
Fe ₂ O ₃		
As ₂ O ₃	-----	.05

Total anhydrous salts, percentage of original sample 21.37.

Bibl.: Bull. 24, pp. 94-98; U. S. G. S. Bull. 580, pp. 252-264, The Owens Basin.

Inyo Development Company has operated a soda plant, on the shores of Owens Lake, 1 mile north of Keeler, since 1885. The process is briefly as follows: The lake water is pumped into large clay vats, vary-



Photo No. 78. Soda Works of Inyo Development Co., north of Keeler.

ing in size from one acre to 20 acres, to a depth of from 6" to 8". It is concentrated by solar evaporation until the carbonates are precipitated. The mother liquid, containing potash, sulphates, chlorides, etc., is drawn into other vats, where the solution is further concentrated for the production of potash (see Potash). The trona (hydrous carbonate of soda)

forms in a crust about $\frac{3}{4}$ " thick and is gathered once a year. The crust is washed free of impurities and introduced into an oil-burning furnace, where it is reduced to the carbonate. An air blast, at the furnace discharge, cools the ash, which is then conveyed to rolls and pulverized. Plant operated by electric power supplied by the Southern Sierras Power Co. From 18 to 20 tons, of heavy ash only, are produced daily. The trona is gathered during October, November and December of each year, employing over a hundred men during that period. Mexican labor is employed at \$2.50 per day. The mill is operated from June 1st to December 31st with twenty men employed. Home office, 218 Mills Bldg., San Francisco, Cal., A. B. Davis, vice president and general manager.

Bibl.: Rept. VIII, p. 226; Rept. XII, p. 409; Rept. XIII, p. 646.

Natural Soda Products Company. Plant situated on east shore of Owens Lake, 2 miles south of Keeler. This company is producing bicarbonate of soda, as well as soda ash. Their process is radically different from that of the older company.



Photo No. 79. Natural Soda Products Co. plant south of Keeler.

The lake water is concentrated in clay vats by solar evaporation and then pumped to two 1000-gallon settling tanks. Subsequently pumped to eight 15,000-gallon tanks. Carbon dioxide, generated from dolomite, is passed up through the bottom of these cylindrical tanks, into which are introduced a series of screens to break up the CO_2 gas. The carbon dioxide precipitates the soda, and the latter is drawn from the bottom of the tank and passed through an Oliver filter; then introduced into furnace and reduced to ash. The tailing solution (mother brine) is to be used for the extraction of potash (see Potash). Daily production

approximately thirty tons. Company reorganized 1915 and have produced steadily since. Home office, Keeler. President, W. W. Waterson, Bishop; superintendent, E. W. Walter.

SULPHUR.

Small deposits of sulphur are reported one mile southwest of Coso Hot Springs and in the mountains east of Big Pine.

TALC.

California Mineral Corporation, formerly known as the Pacific Mineral Products Co., owns a deposit of talc 8 miles southwest of Zabriskie. Auto road to the deposit. The talc is pure white, occurring along the contact of limestone and diorite. The deposit is irregular and varies up to 12 feet in width. Mined by open cuts and tunnels. Worked intermittently since 1912. Shut down September, 1915, due to litigation over ownership. Company recently reorganized, and expects to resume operations shortly. President, G. F. Eisenmayer, Citizens National Bank Building, Los Angeles, Cal.

Simonds Talc Mine. Darwin district, 17 miles by road southeast of Keeler. Elevation 5850 feet. The deposit occurs in a crushed zone in limestone over a width of 70 feet. Strike of deposit N. 45° E., dip vertical. The talc varies in color from gray to pure white, and is

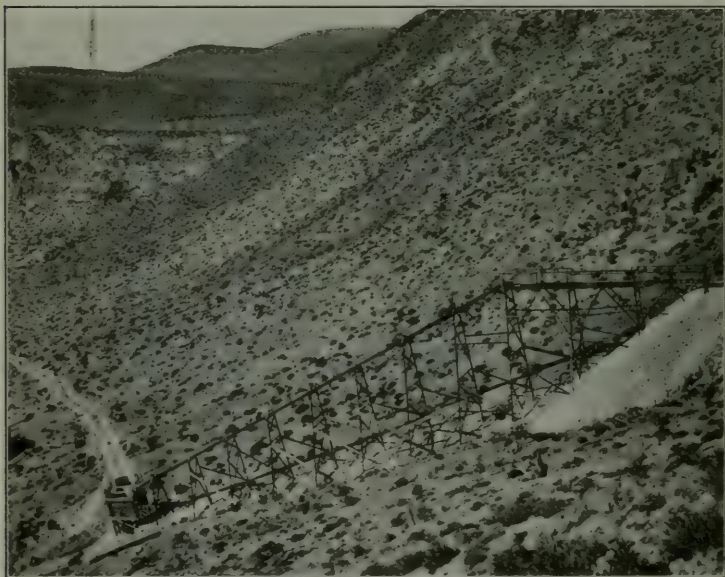


Photo No. 80. Simonds Talc Mine. California Talc Co.

hard and slippery. It is foliated and shattered, as is the inclosing limestone beds. Suitable for grinding purposes only. Very free from grit. Worked by open cuts and tunnel. Working tunnel 140 feet long, cutting talc beds 70 feet wide. Connected by raise to open cut above. Trammed

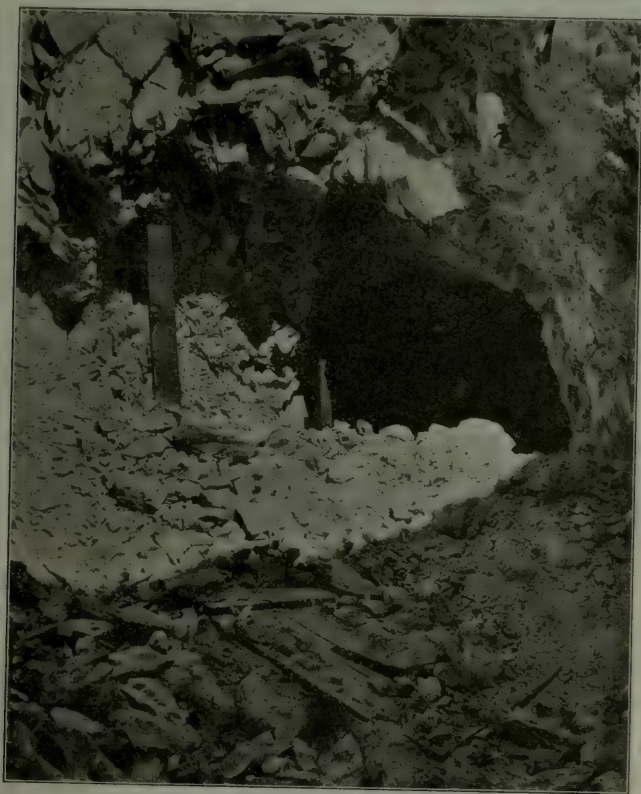


Photo No. 81. Open cut and tunnel at Simonds Talc Mine, southeast of Keeler.

to wooden chute to bin. Truck loaded from bin. Hauled to Keeler in 4-ton auto truck. Two trips daily. Shipped to grinding plant, 175 Hooper Street, San Francisco. Two men employed. Owners, California Talc Company (formerly Groah Mineral Company), 3075 Army St., San Francisco. Superintendent, E. E. Simonds, Keeler.

Tramway Talc Mine (Hoff and Mayes Mine), is situated $3\frac{1}{2}$ miles northwest of Keeler, at the base of the Inyo Mountains, near the mill of the Saline Valley Salt Company. Elevation 3800 feet. Irregular deposit of talc along fault plane in metamorphosed limestone. The talc varies in color from grayish green to black. Very hard and slippery, and said to be free from grit. About forty tons shipped to the John D. Hoff

Asbestos Co., of Oakland, in 1915, was the only production. Idle Owners, J. A. Mayes et al., Keeler, Inyo County, Cal.

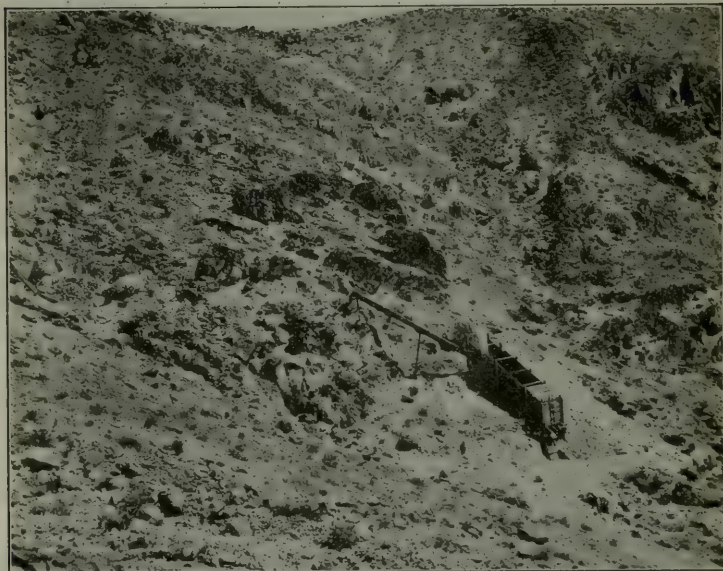


Photo No. 82. Tramway Talc Mine, north of Keeler.

TUNGSTEN.*

The enormous increase in the price of tungsten during the early part of this year has been responsible for extensive prospecting in Inyo County. Before the European war, the average price was \$7.00 per unit (a unit is each 1% in tungsten trioxide). In February, 1915, the price was \$40.00 per unit. It had risen to \$50.00 per unit in February of 1916 and then jumped to \$105.00. That was the highest price reached. It dropped to \$80.00 per unit in March, and since then has gradually decreased. The quotation at the time of this writing is from \$30.00 to \$40.00 per unit, with indications pointing towards a further decrease.

The tungsten ores thus far discovered in Inyo County are mainly confined to two districts, namely: in the vicinity of Bishop, and in the Ubehebe district south of the Racetrack. One small occurrence was also noted northeast of Big Pine.

*Since this report went to press, a report on the "Tungsten Deposits of Northwestern Inyo County" by Adolph Knopf, has been published by the U. S. Geol. Survey as Bull. 640-L. The Nobles, Boyd and Welch, Chipmunk, Mineral Dome and McVan prospects, located after the field was covered by the writers, have been described. The Nobles property, now called the Last Chance, has recently been reported as being opened up with a tunnel by Cooper Shapley, superintendent of the Round Valley Tungsten Company, who expect to install a mill.

Districts.

Bishop District. The tungsten mines of this district are located west and south of Bishop, in the low foothills bordering the Owens Valley. The country rock is granite intruding limestone. The ore is deposited in garnetiferous dykes or ledges along the contact of the limestone with the granite, and was probably formed at the time of the granite intrusion. The dyke rock or ledge matter consists essentially of small crystals of scheelite, garnet, epidote, pyrrhotite, pyrite, magnetite, rose quartz, and biotite. The character of the ore varies, and crystals that are prominent in one portion of the dyke may be entirely lacking in other portions. Malachite is occasionally found in the ore, close to the lime footwall. The percentage of scheelite in the ore varies, but in general is very low, less than 1%. Rich pay streaks, said to run up to 30%, are occasionally encountered. The dykes are massive, varying in width up to 60 feet.

Ubehebe District. The tungsten claims of the district are located south of the Racetrack, in the vicinity of Dodds Spring and Goldbelt Spring. Keeler is the nearest shipping point. An auto road runs from Keeler to Lee's Pump, approximately 30 miles. Trail from Lee's Pump to the locations. The district might also be entered by road from Bonnie Claire, Nevada, by way of the Lost Burro Mine; but about 5 miles of new road would have to be constructed.

The tungsten ores of this district are deposited in narrow veins in granite, close to limestone, or at the contact of the granite and limestone. The ores are scheelite and hübnerite. They are not found associated in the same vein, but occur separately. Scheelite is found in the footwall side of copper veins deposited along granite and limestone contacts. The first discoveries of its existence in the district was on the dumps of old copper prospects. Hübnerite has been found in well-defined fissure veins in the granite, close to the limestone contact. The discovery of tungsten in this region is very recent, so that very little work has as yet been done to determine the extent of the veins. "Shorty" Harris, of Keeler, shipped out a few hundred pounds of high grade scheelite from the vicinity of Hunters Mountain, early in March. This led to extensive prospecting, but to date we have no record of any further production.

Mines.

Aeroplane Mine. Bishop district, 8 miles by road due west of Bishop. Elevation 5800 feet. This property was purchased by the present owners early in 1916, and actual development commenced in April, 1916. The ore body is irregular, varying from 10' to 40' in width. It outcrops near the summit of rugged mountains, 600 feet in elevation above the mill site. A trail has been built up to the workings from the mill. Mined by quarry and tunnel. The tunnel is about 50 feet below



Photo No. 83. Aeroplane Mine at Tungsten, 8 miles west of Bishop, Inyo County.

the quarry, and a raise has been driven to connect with the quarry, through which the ore will be handled. A rich streak of ore, said to run 30% scheelite was encountered in driving the tunnel. When visited, a 75-ton concentration mill was being installed. It was planned to crush to about 10 mesh, using rolls to avoid sliming, and concentrating on tables. Mill ran one month on ore that is said to average over 2 per cent. Power supplied by the California and Nevada Power Company.

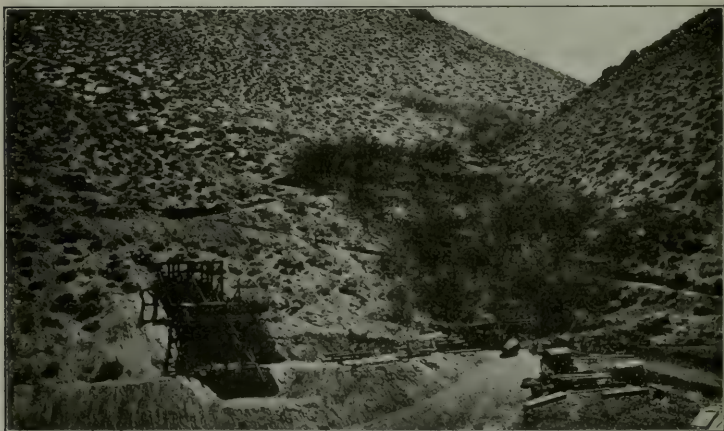


Photo No. 84. Seventy-five ton roller mill being constructed to handle ore from the Aeroplane Mine, near Bishop, Inyo County.

Water is obtained from springs and creek below mine. An aerial tramway is to be built from the mine to the mill. Thirty men employed. Owners. The Standard Tungsten Co., H. W. Hellman Bldg., Los Angeles, Cal. L. E. Porter, superintendent.

Alvord Group. Ubehebe district, 60 miles southeast of Bonnie Claire, Nevada, and 5 miles west of Goldbelt Springs. Scheelite occurs on the footwall of ledge containing copper and iron, on contact of limestone and granite. Ledge said to be 10 feet wide, and outcrops for 300 feet. No development. Located April, 1916, by William Elliot, Ray Spear, and Ross Spear of Lone Pine, Inyo County, Cal.

Buckshot Prospect, Bishop district, is 12 miles by road due south of Bishop, at foot of eastern flank of the Sierras. Elevation 4700 feet. The ore body outcrops in a large lens-shaped mass on a granite and limestone contact. Over 4000 tons of ledge matter exposed on surface, which, it is estimated, will average about 1% scheelite. Up to the time it was visited, only a shallow pit had been sunk on the ore. Recently taken under bond and lease by Charles W. Alvord, of Bakersfield, Cal.

Monarch Tungsten Mine, Ubehebe district, approximately 35 miles north of east of Keeler, between Dodd's Springs and Goldbelt Springs. Road from Keeler to within 4 miles of mine. The ore is hübnerite, occurring in bunches in a fissure vein in granite. Average width of vein 22". Strike NW., dip almost vertical. A 50-foot shaft has been sunk on the vein, with two 50-foot drifts driven from bottom of shaft.

The hübnerite played out at the 50-foot level, but the vein continues. Are sinking shaft with expectations of finding the hübnerite with depth. Located July, 1915, by the Monarch Tungsten Company, Denver, Colorado; president, Fred C. Allen; secretary and manager, Frank D. Allen.

Scheelite Group is 25 miles northeast of Big Pine on the road to the Loretto Mine and Eureka Valley. Northeast flank of Inyo Mountains, overlooking Eureka Valley. Elevation 6700 feet. The country rock is granite and limestone. Scheelite is found on the footwall side of a copper-bearing vein. The vein is in granite, about 100 feet above a limestone contact. Exposed by three shallow cuts, spaced about a hundred feet apart, along the strike. Width of vein 12". At the time visited, the scheelite had only been found in one location on the vein. Considerable development work must be done before it can be determined whether the scheelite occurs in sufficient quantities to mine on a commercial basis. S. G. Drouillard claims to have taken out 400 lbs. of ore which averaged 40% scheelite, while exploiting the vein for copper nine years ago. No production since. Now being developed by the owners, S. G. Drouillard, Frank L. Over and W. H. Leffingwell of Bishop, Inyo County, Cal.

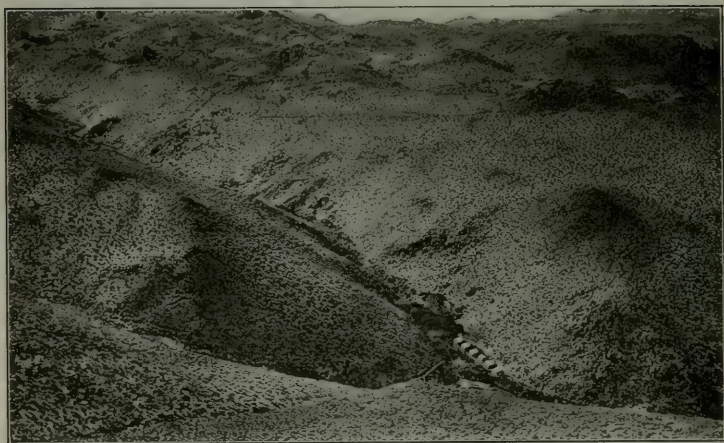


Photo No. 85. Little Sister Ledge, to the left, and camp of the tungsten miners at Tungsten, 8 miles west of Bishop, Inyo County.



Photo No. 86. Looking northward towards town of Tungsten, and mill site of the Tungsten Mines Co., 8 miles west of Bishop, Inyo County.

Tungsten Mines Company, Bishop district, owns a group of claims adjoining the Aeroplane Mine, 8 miles west of Bishop. The development to date is confined to the Little Sister claim. The garnetiferous dyke outcrops on this claim for 375 feet, over top of hill. It is at least fifty feet in width. This ore body is said to average 0.6% scheelite. A tunnel is being driven 165 feet below the outcrop to cut the dyke. Machine drills are used. At the time visited, owners were excavating for the erection of a 300-ton concentration mill, to be located a few hundred feet below the Standard Company's mill and southwest of the Jackrabbit claim. An aerial tramway is to be installed from the Little Sister tunnel to the mill. Expect to employ at least 150 men upon completion of the mill. L. L. Stevens, of Bishop, general manager.

A townsite, to be known as Tungsten City, was surveyed in the cañon below the properties of the Standard and Tungsten Mine companies. When visited it had somewhat the appearance of a "boom" camp, as great activity was manifested in the erection of tents, boarding houses, offices, etc.

VOLCANIC ASH, OR PUMICE.

A bed of tuff is deposited in the Pleistocene sediments of the Amargosa Valley at Shoshone. The bed is impure, carrying some lime with the tuff, and is not adaptable for use in the manufacture of glass. R. J. Fairbanks, of Shoshone, shipped several carloads of this silica to a San Francisco firm, to be used for scouring soap, etc., No recent production. Idle.

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MONO COUNTY.

By ARTHUR S. EAKLE, Ph.D., and R. P. McLAUGHLIN, Field Assistants.
Field work in 1914 and 1915.

INTRODUCTION.

Mono County was created April 24, 1861, and consists of 3030 square miles. It is bounded on the north and east by the state of Nevada, on the south by Inyo County, and on the west by Madera, Tuolumne and Alpine counties. The county is extremely mountainous, the western portion lying among the Sierra Nevada Mountains, whose principal peaks rise to elevations of over 13,000 feet. The greater portion of the county, in its larger features, is a broad table land at an altitude of from 5000 ft. to 7000 ft. above sea level, traversed by a series of approximately parallel ranges running northerly and southerly which rise several thousand feet above the plateau. Quoting from the report of H. A. Whiting,¹ "These ranges have been determined by those grand displacements which characterize the Great Basin structure. They are, therefore, like the Sierra Nevada itself, orographic blocks bounded by faults and so tilted that their upturned edges form mountain crests with a steep descent on one side and more gentle slope in the opposite direction. Among such ranges two grand mountain masses are preeminent rivaling the Sierra Nevada in height and majesty; they are the Sweetwater Mountains, along the eastern border of the county in its northern portion, and the White Mountains, crossing its extreme southeast corner."

In the high Sierras glaciers exist. These are the remains of "glaciers of large size which formerly flowed down the high Sierras and deposited moraines of great magnitude, on which terraces of the quaternary lake that formerly filled the Mono basin to a depth of nine hundred feet, are distinctly traced."²

Mono Lake is the remainder of this great inland sea, and is the only large body of water in the county. It lies ten miles south of Bodie at an elevation of 6426' above sea level (October, 1909, U. S. G. S.), with an approximate area of 1100 square miles. This lake is of the same character as Owens Lake, described in our Inyo County report, containing the carbonate and sulphate of soda, sodium chloride, etc. For a detailed description of this lake the reader is referred to the account cited in the footnote.²

Owens River, in the south, which takes its rise in a high peak of the Sierras and flows southward emptying into Owens Lake, and Walker

¹State Mining Bureau, Report VIII, pp. 353-354.

²U. S. G. S., Monograph XI, p. 267.

River, which flows northward into Nevada, are the principal streams; however, the numerous large streams which flow down the east flank of the Sierras furnish excellent water power during the greater portion of the year.

Mining is the principal industry of the county, although at present very little work is being done. Its period of greatest activity was during the late seventies and early eighties, when the population increased from about 400 to over 7000. The population is now about 2000. This county suffers the disadvantage of being very inaccessible. The only railroad in the county is the Nevada-California Railroad which cuts the southeast corner for a distance of 68 miles. The greater portion of the county is reached by stage lines from Nevada. With increased transportation facilities there will undoubtedly be great mining activity, as there are many highly mineralized vein systems that under present conditions can not be profitably worked.

The following description of the mining districts and mineral resources of Mono County have been written by Arthur S. Eakle, Ph.D., and R. P. McLaughlin, who spent several months in the field in preparation for the same. Dr. Eakle made a trip through the northern portion of the county in the Antelope Valley region during the summer of 1915 to supplement and complete the report of R. P. McLaughlin previously prepared, on the older mining districts, principally the Bodie and Masonic districts.

Bibl.: In addition to the references given in the text of this report, the following give some account of the earliest history of mining in Mono County: Min. Res. W. of Rocky Mts., 1868, pp. 177-179; 1871, p. 28; 1873, p. 16; 1874, pp. 22, 27; 1876, p. 32.

Year	Gold, value	Silver, value	Lead		Lime		Miscellaneous	
			Pounds	Value	Barrels	Value	Amount and kind	Value
1880	\$2,407,236	\$582,905						
1881	3,385,000	300,000						
1882	2,200,000	380,000						
1883	1,750,000	290,000						
1884	1,000,000	235,000						
1885	482,860	91,849						
1886	439,558	163,502						
1887	382,468	118,945						
1888	297,000	75,000						
1889	193,264	86,827						
1890	144,180	52,293						
1891	302,415	18,983						
1892	396,296	271,038						
1893	293,837	11,401						
1894	358,824	11,549	50,000	\$1,500				
1895	592,690	84,910	94,400	2,926			800 cu. ft. Onyx	\$8,000
1896	451,553	82,283	73,500	2,205	500	\$2,000	3,000 cu. ft. Onyx	24,000
1897	620,101	72,491	32,000	1,088	1,200	4,800		
1898	446,917	66,667	75,000	2,737	3,000	4,000		
1899	697,069	47,547	28,000	1,190	1,200	3,750		
1900	670,260	75,921	50,000	2,000	1,100	4,000		
1901	493,355	25,091	29,000	1,160	2,000	3,000	Copper	305
1902	510,596	36,548	4,400	154	2,000	2,000		
1903	334,713	20,067	1,000	36	215	850	1,600 lbs. Copper	208
1904	268,930	2,955						
1905	308,884	11,240						
1906	338,698	13,151						
1907	393,971	29,797					7,100 gals. Mineral water	5,375
1908	413,946	26,134					Unapportioned d, 1900-09	106,772
1909	354,909	37,792						
1910	435,724	9,391	37,000	1,665				
1911	261,232	35,508			4,961	3,721	8,179 lbs. Copper	1,385
1912	377,518	70,692	23,936	1,077	2,135	1,600	79,319 lbs. Copper	12,294
1913	147,271	23,283					Salt	150
1914	7,000	10,000					Other minerals	200
1915	107,302	1,923						
Totals	\$22,114,447	\$3,552,593	498,236	\$17,738	20,129	\$34,721		\$156,854

Totals.				\$22,114,447
Gold				3,552,593
Silver				17,738
Lead				34,721
Lime				158,854
Miscellaneous				
Grand total				\$25,848,353

ANTELOPE VALLEY REGION.

The area of Mono County which is chiefly described under this heading is situated in the eastern side of Antelope Valley in Townships 8 and 9, Range 23 East, adjacent to the California-Nevada state line. Antelope Valley extends south from the state line for a distance of ten miles and is about four miles wide near the state boundary. A good stage road connects the valley, with Minden, the nearest railroad station and this road continues south through the valley and central portion of Mono County to Bridgeport and beyond. Topaz, in the west-central part of the valley, and Coleville, three miles further up the valley, are two small settlements containing postoffices. The valley land is mostly owned by the Antelope Valley Land and Cattle Company, and has been converted by irrigation into a fine alfalfa and stock ranch. The West Walker river flows northerly through the valley and furnishes plenty of water for irrigation. Much of the low land of the valley is often inundated by the river overflowing its banks, making marshes and sloughs. The valley is 5000 feet in elevation, and practically nothing but alfalfa can be raised.

The valley lies between high ridges of granite and metamorphic gneisses and schists, which cover the larger part of Mono and Alpine counties, these ridges being a portion of the series of metamorphics on the east flank of the Sierras. The valley on its western side is faced by a high escarpment of gneisses, schists, and granites and these ridges rise to a height of 7000 and 8000 feet. The west side is almost a continuous wall, broken near Coleville by a smaller side valley, known as Little Antelope Valley. This valley has the appearance of an amphitheatre perched several hundred feet above the main valley. The floor of this valley is composed of the till and wash from the mountains back of it. Roderique Creek flows through this valley and a branch road follows up this creek and cañon, past the Golden Gate mine and over the ridges into Alpine County connecting with the road through Monitor Cañon. At present this road is unimproved and not much more than a trail.

The eastern side of Antelope Valley is in marked contrast to the western in topography, and in character and composition of the hills. At the extreme southern end or apex of the valley the granitic ridges on both sides of the valley converge and leave only a narrow cañon through which the West Walker river rushes into the valley. The granitic ridges strike northeast from this point and have in their west flank a series of lower ridges and hills of metamorphic limestone and volcanic andesite. These hills border the valley and present weathered and rounded surfaces with sloping sides.

Character of the rocks.

Gneisses and schists are the prominent rocks which form the scarp in the west. The gneiss is a light gray, hornblende-biotite rock and shows its banded character very plainly on the wall faces along the valley. The schist is the common, dark gray, muscovite-biotite schist, easily splitting along its schistose cleavage. This schist is abundant at the head of Little Antelope Valley, forming high ridges along Roderique creek. The wall of rock at the head of the valley is granite and this massive igneous rock covers much of the country to the south. It is mostly a light gray, hornblende-biotite granite with white feldspars but occasionally the feldspars are colored reddish, imparting a pink color to the granite. The rock is very uniform in structure and would make excellent building and ornamental granite.

The hills on the eastern side of the valley are of greater mineralogical interest and importance because of the presence of crystalline limestone and contact deposits of minerals.

A limestone belt borders the valley and forms a wall for a few miles. It strikes north and south and its southern end probably rests against the granitic or gneissic hills, while its northern end terminates at Lobdan cañon. This belt of limestone is approximately 3000 feet wide but has been intersected by intrusive masses and dikes of diabase and covered by gravel and conglomerate in portions of it. A section up White Way cañon shows solid limestone for about 700 feet followed by an intrusive mass of diabase 300 feet, and then a covering of coarse gravel conglomerate and till for 1000 feet until the limestone again appears forming the eastern part of the belt. The limestone has all been metamorphosed into a crystalline limestone and marble by the general metamorphism of the original sedimentary rocks of the region and has been further and more intensely metamorphosed locally by the diabase and andesite intrusions. East of the limestone belt porphyritic andesite occurs followed by schist and granite. The main deposits of minerals in the limestone have been near and along the contact with the andesite. The mineralized portion of the belt is perhaps 750 feet thick and the adjacent andesite has also been altered and mineralized.

The Minerals.

Prospectors have been over the ground in this district and left their traces in small holes and claim monuments but no work has even been done which would prove the existence of any deposits large enough to warrant the investment of capital. Small outcrops of minerals occur and the general indication is that the deposits are pockets in the limestone and it is problematical if they are of large size. The remoteness from a railroad precludes the shipment of any but high grade ore and the district will probably remain idle until good bodies of such ore are

found. The district is known as the West Walker River Mining District and it contains gold, silver, lead, copper, zinc, cadmium and iron minerals, and barite, marble and building stone.

Gold occurs in the disseminated pyrite and also as free gold. The porphyritic andesite which occurs in contact with the limestone has been altered and mineralized by solutions so that it appears as a soft, friable mass of white and iron-stained, kaolinized feldspathic rock, containing seams and veins of white clay and porous silica. These seams occasionally run quite high in gold as shown by panning and assays, but all of those exposed in the pits are mere streaks and soon pinch out. The rock containing these richer streaks is too low grade for working so the value of the claims depends upon the frequency and grade of the veinlets. On the western slope of Round Mountain some prospect holes show seams which readily pan gold and run as high as \$300 per ton. Only shallow pits have been dug which do not prove the value of the claims. This mineralized and silicified porphyry is quite extensive in the region and may contain rich pay seams.

The only gold produced in the district has come from the **Golden Gate Mine**, in the hills in the western side of the valley. This mine is located in Roderique Cañon at the head of Little Antelope Valley, about three miles from Coleville. This mine has changed hands several times since its discovery in 1898 and is now owned by Brown & Donovan. It is for sale or lease and no ore is being mined. The property consists of fifteen claims on the hills enclosing the cañon. The ore is free milling gold ore and auriferous pyrite. Veinlets and stringers of quartz and lenticular bodies of sulphides occur in a ferruginous schist at its contact with diabase. The steep sides of the cañon permit of adit tunnels at different levels and the present workings consist of five of these levels with three adits. There is an abundant supply of water for milling furnished by the creek and the owners have erected a 10-stamp mill in the north side of the cañon and an aerial tramway to connect the mine and mill. The mill is at present idle. There are no concentrators and the owners depend on the mill for returns. Four men are at present employed in development work. All work is done by hand drilling. This mine has also been described by R. P. McLaughlin.³

This section also contains the famous "White Metal" which is so hard and tough that it can not be broken or flattened by hammer blows. A short distance up an adjacent cañon which opens into Little Antelope Valley, the writer was informed that a deposit occurred which produced this white metal when fused. A climb to this deposit for specimens showed it to be a ledge of white granular quartzite in

³See p. 165, *post*.

which pyrite grains and crystals were thickly disseminated. It is said that London mining men after seeing specimens came over to inspect the deposit but nothing ever resulted from their visit. The "white metal" was obtained by heating the pyrite in a forge where the charcoal contaminated the iron, reduced it and converted it into a steel button. The pyrite is auriferous, assaying \$9.00 per ton.

Silver and lead occur in the limestone as argentiferous galena. No silver minerals have been found and it is probably associated with the lead and copper sulphides. There are pockets of galena in the rock assaying several ounces of silver, but these pockets can not be depended upon as a silver proposition. In some of the calciferous altered porphyritic rock iron and lead carbonate have resulted by oxidation and may carry a few ounces of silver as shown in Round Mountain. Copper outcrops in several places show malachite and azurite as stains and good specimens. The original mineral is chalcopyrite which is associated with garnet, most of the outcrops being garnetiferous rock. They are not presumably of importance as copper deposits.

The district shows much iron and the hills are stained yellow and red by the alteration of the iron minerals, especially pyrite. Pyrite is common in porphyry and to some extent in limestone. On one of the claims, known as the South 40, there is an outcrop of massive magnetite associated with a black hornblende rock containing tourmaline. An old tunnel run into the hill to top this deposit has revealed a large body of magnetite as a contact deposit. This magnetite contains a small percentage of zinc and cadmium as sulphides intimately mixed with the magnetite. Attention was first called to this deposit by specimens of the magnetite coated a bright lemon and orange yellow with the rare sulphide of cadmium, greenockite. The cadmium is evidently associated with the zinc, and while of some value as specimens, it has little or no commercial value. An analysis of the magnetite shows the amount of the two sulphides to be very small, about one per cent. The amount, however, would probably vary.

At the northern end of the limestone belt a deposit of barite occurs and outcrops of the mineral indicate that a large deposit of the mineral occurs. Specimens obtained from a small hole show it to be a massive white pure barite. This deposit may prove of value in the future and several claims have been located on it.

Some of the limestone has been metamorphosed into pure white marble and there is an old marble quarry in White Way Cañon which is now owned by Ed. Davis. The marble was quarried from the bed of the creek and some large blocks have been taken out by drilling and used for monumental work. The marble has a decided rift and appears somewhat columnar in its structure instead of homogeneously and uniformly granular; consequently crushing strength and perhaps

its durability would not be equal to that of a fine-grained compact marble. The quarry has long been idle as the long haul to the railroad and shipment to a market render transportation charges prohibitive.

This section of Mono County has not been thoroughly prospected and it presents some attractive features for the investment of a little capital to open up some of the ore outcroppings.

The main road follows the western edge of the valley at the foot of the western granitic walls and enters the cañon of the river and continues due south along the banks of the river to Hardy Station or Blackburn. The cañon is narrow with sheer walls and precipitous sides of granite for the greater part of the distance. Near the Toll-gate the granites on the east have a capping of black volcanic rock and as the road turns east from Blackburn it passes through a region of later eruptive rock.

At **Fales Hot Springs**, obsidian, pitchstone, tuff and old travertine deposits occur. The more recent volcanic activity, which is evidenced by the high volcanic peaks south of the springs and the pumice and obsidian boulders, is still further in evidence by the boiling water of this spring. If the county were well-populated this would undoubtedly become a well patronized resort. The volcanic character of this section is seen on the road to Bridgeport. About one mile southeast of the town of Bridgeport about one-half mile east of the road to Bodie, the large deposit of travertine occurs which has been described in former reports of the bureau and which McLaughlin mentions.⁴ The travertine or lime carbonate occurs in several ridges of varying lengths, the longest several hundred feet. These ridges are somewhat covered and stand ten to fifteen feet above the surface, with an elliptical form generally, being slightly higher than the diameter of the base. It seems probable that this section was formerly occupied by pools which were fed by hot springs at the bottoms, the waters being charged with lime and soda carbonates held in solution. As the water trickled over the edges of these pools, the carbonates were precipitated by evaporation, forming a vein with fluted surfaces. With the cessation of spring flows and drying up or breaking of the walls, the pools became emptied leaving these veins standing. Most of the material is gray, discolored by iron and of very poor quality as a marble. In some portions the iron oxides have stained the travertine deep red and brown and a quarry was opened in 1895 and slabs of the material were used in the old City Hall in San Francisco. Some pieces could be obtained which would make good slabs marked by pleasing designs, but the most of the material is pitted and unfit for use. Not much of the material was ever quarried. There still remain small hot springs charged with the bicarbonates, and the bottoms of the pools are coated

⁴See p. 173, *post*.

white with the alkalis. Some attempt was formerly made to extract soda from the pools. All of the elliptical ridges are split asunder along their central line leaving a cleft several feet deep and a foot or more in width. It seems probable that on the release of water pressure and settling of the base these cracks were brought about. The rock is not very coherent and a little movement of the base on one side could easily account for the breaks. The section between Bridgeport and Bodie and around the latter town has been well covered by R. P. McLaughlin who gives descriptions of the mines in the following chapters.

BODIE AND MASONIC REGION.

Geology.

The mineral resources of this region can best be understood by a brief description of the geologic features which are shown on the accompanying map, upon which the section lines correspond to those shown upon the Bridgeport Topographic Quadrangle of the U. S. Geological Survey. It should be remembered that the geologic work was hurriedly done, being simply a reconnaissance.

The oldest rock in the region is the metamorphic series which consists of schist, quartzite, altered slate and similar rocks. It possibly belongs to the same series as the so-called slate, extending along the eastern flank of the Sierra Nevada and which is mentioned later. One of the most prominent exposures of this series is in the vicinity of Rough Creek, about 4 miles north of Bodie, where it consists of some large croppings of chalcedonic quartzite, dark, almost black quartzite, showing contorted lines either of bedding or flow under pressure. In other places as near the state line T. 5 N., R. 27 E., the quartzite has scarcely lost the appearance of a fine, hard sandstone with gently dipping beds and also varies to the appearance of black flint and white porcelain. Cinnabar in a 2-foot vein of chalcedony is located in this vicinity,⁵ and some work was done many years ago. None was observed during this visit.

That portion of the series near the town of Masonic consists mostly of fine grained mica schist. That portion of the series on the wagon road about six miles south of Masonic shows light colored, slightly altered shale. The small areas in Sec. 34, T. 5 N., R. 26 E., are interesting on account of their isolation and small extent. Most of this rock is breccia and a light colored tuff or altered sandstone. Faulting is evidenced by slickensided exposures. Some prospect work has been done for quicksilver, but none was observed by the writer.

As seen from the above brief notes the series is very complex, probably having originally consisted largely of sediments which have been altered by heat and pressure during the upheaval of the Sierra Nevada Mountains and the accompanying granitic intrusion.

⁵Annual Report State Mineralogist, 1888, p. 356.

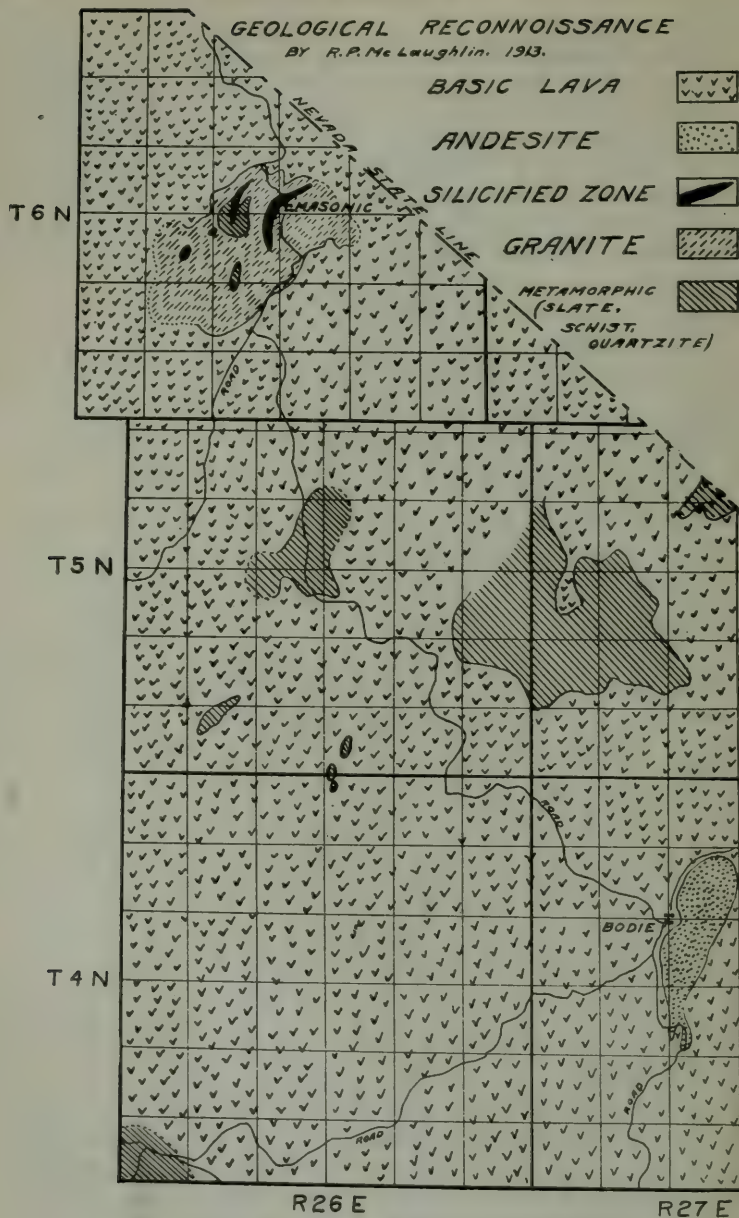


Plate I. Map of Portion of Mono County, California.

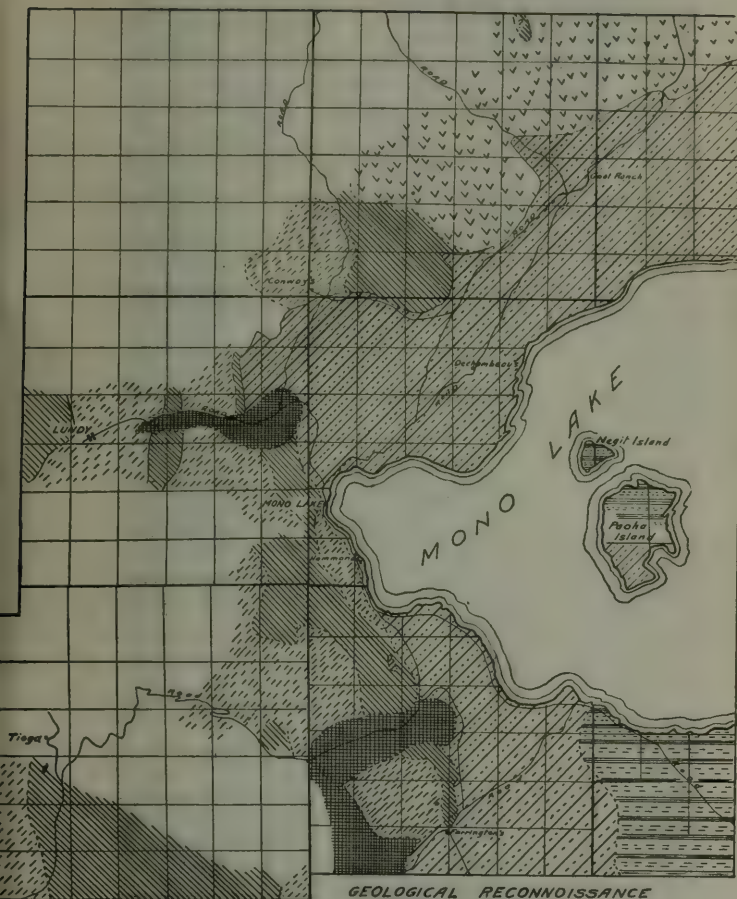
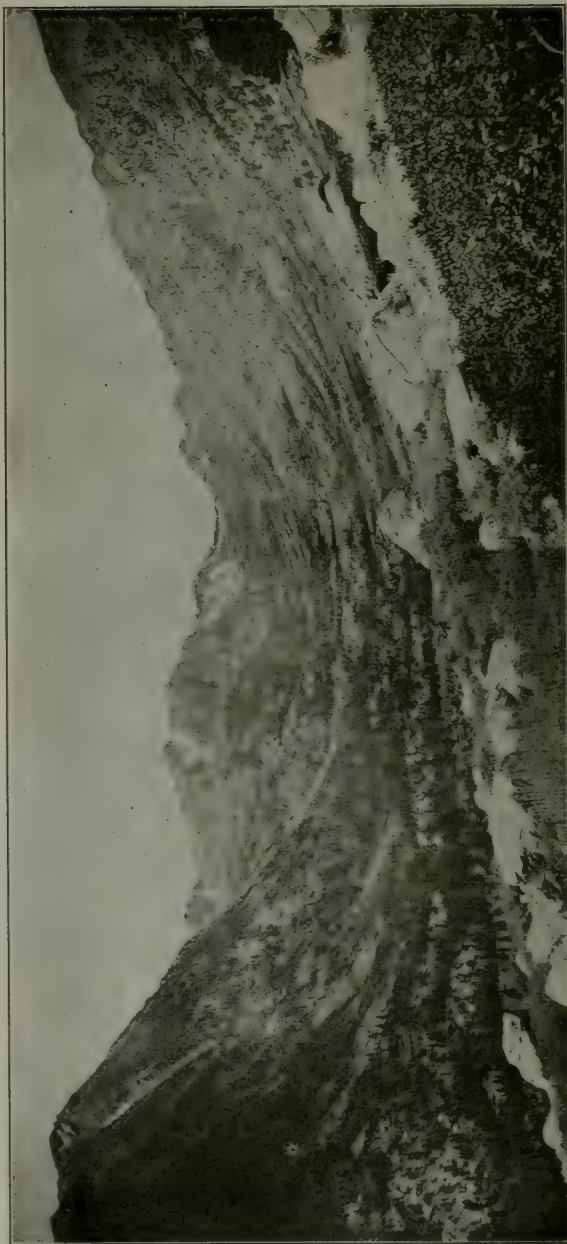


Plate II. Map of Portion of Mono County, California.



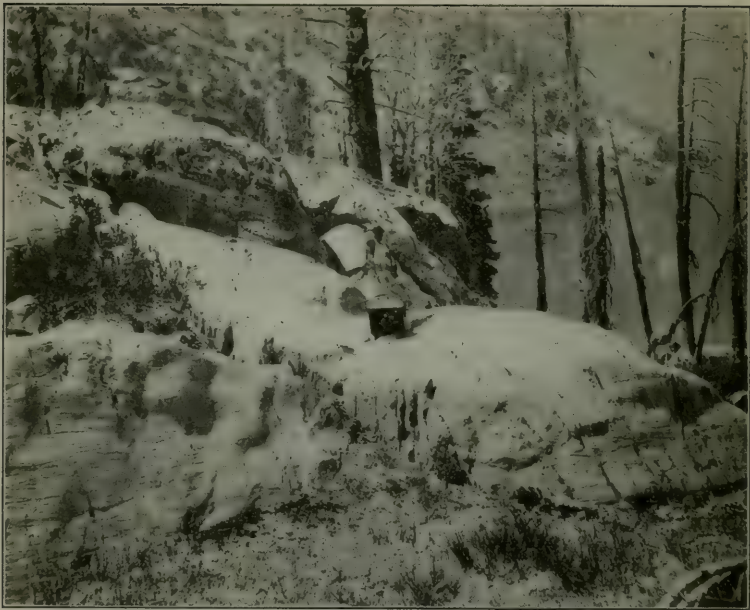
Upper end of Green Creek Cañon, as seen from head of northeast lateral moraine. A beautiful example of a U-shaped glacial cañon. The sides and floor of the cañon are granite. Green Creek is the source of water for the hydroelectric power plant of the Standard Consolidated Mine, Bodie. Photo by Walter W. Bradley.

The *granite* shown around the town of Masonic varies in different portions of the area, but is usually coarse grained, showing feldspar crystals frequently a half inch long. It is broken by several series of joint planes. To the north of town their strike is northeast and southwest, dipping about 60° towards the northwest, while south of town the most prominent fractures strike nearly east and west and dip northward. Probably the entire mass has been subjected to severe strains and movements, causing some of the more prominent jointing planes. Along the southern and eastern borders of the *metamorphic* area, one-half mile west of Masonic, the relation of the two series is plainly seen. That the granite is the younger is shown by its intrusion as dikes, several feet wide, for a distance as much as 50' into the schist, which is generally laminated parallel to the contact line between the two formations.

The silicified zones are among the most important features shown on the map, as in them occur most, if not all, of the ore bodies of the Masonic district. North of the main road through the district, in Section 15, is a bold quartz or quartzite outcrop several hundred feet wide and over one hundred feet high, being one of the most noticeable portions of the silicified areas. These zones doubtless exist in places where considerable fracturing and possibly movement has taken place in the granitic country rock.

As shown on the two accompanying maps the zones correspond closely with the general direction of the jointing planes in the granite. It is also suggested by some observations, notably about 200' SE. from the Serifa shaft, that there may have been intrusions of igneous dikes along some of the fractured areas. In general the rock in these zones is quartz, but not in the usual vein formation. It is usually dark colored or rusty in appearance and the walls of the zone are not clearly distinguished, especially upon the surface of the ground. It is made up of large quartz boulders, silicified granite, breccia and some clay as from decomposed country rock. The ore of the district has an open or porous appearance and consists of light colored chert and coatings of chalcedonic quartz accompanying breccia of light colored angular fragments cemented in a dark brown groundmass. Its appearance is unusual as compared with other ore bodies of the surrounding country, which doubtless accounts for its comparatively recent discovery. It indicates that after quartz began to be deposited there were many disturbances in the channels, opening, closing, and crushing. Irregular shaped ore bodies are to be expected.

The rock immediately east of Bodie has been described as hornblende *andesite* and that immediately surrounding it (mapped as basic lava) is also andesite, but of a much coarser texture. Their difference in color is marked, the outlying rock weathering to a pink while the



Glacial striae or scoring on bedrock (metamorphic) above East Lake at head of Green Creek, Mono County. Photo by Walter W. Bradley.



Glacial moraines on Green Creek, Mono County. View looking down creek from below mouth of cañon proper. The two ridges on either side are lateral moraines, which at their upper end are 500 feet high. The meadow in the middle-ground is due to silting up of the lake which was formed by the terminal, glacial moraine whose position is marked by the line of aspen trees crossing the valley. Photo by Walter W. Bradley.

hornblende andesite weathers to a reddish brown. The surrounding lava flows lap onto the andesite, which was probably standing as a hill long before the volcanic flows occurred. There is some evidence, such as occasional inclusions of chert at a depth of about 500', in the mines, that the older andesite broke through the underlying metamorphic rocks. The relation between the andesite and overlying andesite can be seen east of the Standard mill and more plainly at Sigourney Flat, where the sharp hill, around which the wagon road winds (SW. $\frac{1}{4}$ of Sec. 21, T. 4 N., R. 27 E.) consists mostly of the lava capping, the contact dipping southward.

The andesite is a most important rock economically as it contains all the quartz veins of the Bodie district. These veins are a most interesting feature, geologically, which has been fully described, as hereafter noted. The most northern exposure of quartz veins in the Bodie andesite is at the Syndicate Mine and extends south more or less continuously for three miles to Sigourney Flat. Only the northern half of these croppings have been productive.

The rocks mapped as *basic lava* are of several varieties and may include some which would not strictly fall under that name. Along the road a mile and a half south of Masonic it is basalt. About three miles south of Bodie it is bedded volcanic tuff and also tuff composed of angular boulders of various sizes cemented by the finer tuff, while occasional dikes of dark igneous rock are plainly seen protruding through and above the tuff. About two miles north of Bodie on Table Mountain the most recent lava is seen having flowed out from the cone-shaped crater known as Beauty Peak, which is situated on the Nevada-California boundary line. The original smooth surface of this particular flow is but little disturbed, while the older flows are much eroded. The entire mass has a characteristic and monotonous appearance, forming pink or dark brown rounded hills. The formation possibly attains a maximum thickness of 500' in some places. Along the road in Cottonwood Cañon, 3 miles south of Bodie, the volcanic breccia or conglomerate has a damp appearance and is frequently referred to as an oil seepage. Its appearance is really due to magnesium salts which are hygroscopic.

In the following descriptions many old, idle or abandoned properties, are omitted as nothing could be added to previous reports.

BODIE DISTRICT.

This mining district has been and still is the most important in Mono County. Up to the end of 1888 it had produced \$18,097,922 in gold and silver and from that time until the end of 1912 over \$6,150,000 has been produced. The district was organized in 1860 and in 1863 a New York company began mining operations on the property later

known as the Syndicate, now the New Bodie, but failed and the district was practically idle and deserted until 1872, when rich ore was discovered in one of the old claims and milled in arrastras on Rough Creek. In 1876 a San Francisco company began mining on what is now known as the Standard property, less than half a mile from the ore bodies discovered some 16 years previous. In two years rich strikes created great excitement and much development work was carried on by about 50 companies, however, expectations were not realized and about 1880 the camp declined. The above facts and a description of the geological occurrences to which little can, even now, be added, were set forth by H. A. Whiting in 1888.⁶

Subsequent history of the camp is interesting principally on account of the long period of activity upon lower grade ore deposits all within the early defined limits. A recital of developments of new mining and particularly metallurgical methods in this district gives an outline of the advance of knowledge of gold mining in California, as many new methods have seen early trials here under managers who have since achieved world-wide fame.

About 1890 concentration with Frue vanners was tried as an experiment and leaching of tailings valued at \$7 to \$8 per ton at a cost of \$3.50 was an innovation. In 1892-1893 a hydroelectric plant with 12½ miles of transmission line was built under direction of Mr. T. H. Leggett, to economize in milling, as wood at \$10 per cord had been costing \$2000 per month to crush 50 tons per day in a 20-stamp mill.⁷ Successful operation reduced milling cost to \$1.46 per ton.

Standard Con. Mining Co. For many years, only this concern has been operating in a large way and as similar methods are likely to be applied to any of the remaining ore bodies worked in the future the following data from the company's annual reports, kindly furnished by C. E. Grunsky, Jr., formerly superintendent⁸, are interesting.

⁶Report VIII, pp. 382 to 401.

⁷Report XII, p. 419.

⁸Mr. Grunsky was succeeded by Chester A. Allen, who continued as superintendent to February 23, 1915, when the property was transferred to J. S. Cain of Bodie. The tailings ponds were exhausted in October, 1913, since which, until October, 1916, the slime plant has not been in operation. No ore was treated during 1914, nor in the early part of 1915, but development was continued.

Under date of October 16, 1916, Mr. Cain writes that good ore is being obtained by leasers on several levels of the mine, from small veins, assaying from \$100 to \$300 per ton, and that the mill is crushing ore from the 318' level yielding \$250 per ton on the plates. Also, they are hoisting ore averaging over \$200 from the 528' level from a point 1000' east of the Standard shaft. Good ore is being opened up on the 350' level south of the Bulwer tunnel, about 50' west of the Standard shaft; and on the 200' level of the Bodie tunnel, 400' south of the Syndicate ground. These various veins were found by crosscutting. The slime plant is again in operation treating tailings from the mill direct. The Lent shaft is being unwatered, and it is intended to unwater the Standard to at least below the 800' level, as it is claimed that there is silver ore on that level. The photograph of the mine map reproduced herewith was obtained through the courtesy of Mr. Cain.



Bodie, Mono County, California. Panoramic view looking southwesterly. Standard Consolidated Mill at left, with tailings flume in foreground running to cyanide plant at right. Tailings ponds in center. The snow-drifts near horizon at left, center and right mark the presence of fault scarps. Sierra Nevada Mountains in left distance. Photo by Walter W. Bradley.

Black Point.

Black Island. Paoha Island.

Mono Craters.



Mono Lake from the west side. Elevation 6,426 feet (October 1909, U. S. G. S.). Photo by Walter W. Bradley.

Year	Production	Dividends	Tons of ore	Value per ton	Tons of waste	Development in feet	Cost mill per ton	Cost mining per ton	Per cent saved in mill	Total per cent saved	Remarks
1877 ^a	\$784,522 80	\$890,000 00	†	---	†	†	---	---	---	---	---
1878 ^a	1,025,333 35		---	---	---	---	---	---	---	---	---
1879 ^a	1,448,845 47		---	---	---	---	---	---	---	---	---
1880	1,939,384 62		†	---	†	†	---	---	---	---	---
1881	1,952,843 55	550,000 00	†	---	†	†	---	---	---	---	---
1882	2,049,521 53	950,000 00	†	---	†	†	---	---	---	---	---
1883	1,175,728 01	975,000 00	†	---	†	†	---	---	---	---	---
1884	1,064,934 46	375,000 00	†	---	†	†	---	---	---	---	Assessment of \$25,000.
1885	242,683 74	50,000 00	†	---	†	†	---	---	---	---	---
1886	226,988 86	---	†	---	†	†	---	---	---	---	---
1887	228,821 00	---	†	---	†	†	---	---	---	---	---
1888	302,207 80	30,000 00	†	---	†	†	---	---	---	---	---
1889	127,340 94	40,000 00	†	---	†	†	---	---	---	---	Assessment of \$75,000.
1890	134,900 82	---	†	---	†	†	---	---	---	---	---
1891	84,692 26	---	†	---	†	†	---	---	---	---	---
1892	237,995 78	18,992 80	†	---	†	†	---	---	---	---	---
1893	239,381 70	28,354 20	12,420	---	7,017	5,363	---	---	---	---	Electric power introduced.
1894	171,535 59	18,992 80	6,950	\$28 46	8,094	7,342	\$3 78	\$6 02	74	---	---
1895	195,907 50	37,895 60	10,111	16 63	7,342	4,334	4 42	9 85	79	---	---
1896	234,617 99	18,992 80	10,160	20 40	13,057	4,413	3 42	7 31	70	---	---
1897	294,278 97	35,678 80	12,967	22 57	9,527	6,407	3 12	8 90	65	---	---
1898	261,750 43	35,678 80	---	---	---	6,026	2 92	7 56	66	---	---
1899	445,179 98	53,518 20	12,358	38 71	10,605	5,282	2 22	8 11	72	---	---
1900	425,613 78	71,337 60	17,883	26 06	15,928	6,761	1 80	8 08	67	---	---
1901	351,894 05	71,337 59	20,675	19 14	16,775	7,961	2 17	7 48	66	---	---
1902	360,775 40	71,337 60	18,047	18 48	18,355	7,504	1 98	7 93	68	---	---
1903	309,425 56	53,518 20	14,736	20 70	16,863	6,106	2 59	9 05	66	---	---
1904	221,870 03	---	17,784	18 56	20,954	6,049	2 24	8 33	62	---	Slime, cyanide plant began operation.
1905	275,048 91	17,839 40	10,210	---	---	---	1 69	5 97	---	---	---
1906	325,069 05	44,598 50	18,240	19 77	---	5,437	1 60	6 26	---	---	---
1907	284,047 36	35,678 80	16,021	17 15	9,167	3,654	1 43	6 92	42	---	---
1908	253,252 02	35,678 80	14,229	16 36	8,179	3,282	1 35	7 22	28	90	---
1909	226,404 06	---	11,782	14 16	14,784	6,087	1 63	8 79	28	88	---
1910	261,935 39	17,839 40	13,138	14 88	13,432	4,460	1 28	7 55	38	88	---
1911	235,476 81	17,839 40	18,798	15 077	6,254	---	2 02	12 67	41	91	---
1912	188,902 34	---	8,150	11 72	14,749	6,216	1 92	10 71	46	90	Mill and slime plant closed October to end of year.
1913	132,943 69	44,598 50	6,342	13 08	---	2,846	1 64	10 50	48	90	---
Totals	\$18,202,855 62	\$5,264,407 79	260,901	---	219,905	104,442	---	---	---	---	---

^aFigures 1877, 1878, 1879 from Annual Report State Mineralogist, 1888. †Earlier figures not available. ‡Dry tonnage from 1911; wet tonnage previously. The property comprises about 200 acres. Besides the original Standard claims, the following old companies were absorbed in 1895: Bodie, Bulwer, Mono and Summit and the Bodie tunnel was purchased in 1901; practically all the land between the New Bodie (Syndicate) and the Southern Consolidated.

The veins at present being worked are small, probably averaging about a foot in width, most of them having a dip of over 70°. The great number of veins in the property is indicated by the fact that during the year 1912 development work was done on 35. Probably there are several hundred within the area of the company's ground.

The veins are nearly parallel, having a north and south direction and the distance between them probably averages 30 feet. All mining is hand work, either drills or "picker bars" being used to put in powder. Mule trains deliver the ore in one ton cars from underground ore chutes through adits to the 20-stamp mill. No mining below about 500' from the surface of the ground has ever been profitable and nearly all the ore extracted in the district has been from above the water level, which is now 521' in the Lent shaft. Pumping from the mine is only to supply the mill and cyanide plant.

During the years 1911 and 1912 mining costs per ton of ore have been as shown by the following subdivision:

Development—	1911	1912
Labor -----	\$4.304	\$3.701
Supplies -----	1.077	1.089
Power -----	0.038	0.067
	<hr/> \$5.419	<hr/> \$4.857
Stoping—		
Labor -----	\$4.735	\$4.335
Supplies -----	2.478	1.448
Power -----	0.042	0.078
	<hr/> 7.255	<hr/> 5.861
Totals -----	<hr/> \$12.674	<hr/> \$10.781

Ore is crushed in a 20-stamp mill and the cyanide treatment of the tailings consists of sliming in a tube mill and filtering by vacuum filter.



Mill of Standard Consolidated Mine at Bodie. Incline at left is for ore cars. High-line flume conveys tailings to cyanide plant. Photo by Walter W. Bradley.



Moore vacuum filter and tanks in cyanide plant of Standard Consolidated, Bodie. Photo by Walter W. Bradley.

Results of Stamp Milling.

Year	Ore		Saved by mill	Ounces amalgam	Value tailings per ton	Stamp duty
	Tons milled	Value per ton				
1911	8,798	\$14 74	\$59,381 03	15,876	\$7 99	2.5
1912	8,150	11 72	48,252 13	12,537	5 80	2.3

Cost Per Ton Milling, 1912 (8,150.38 Tons).

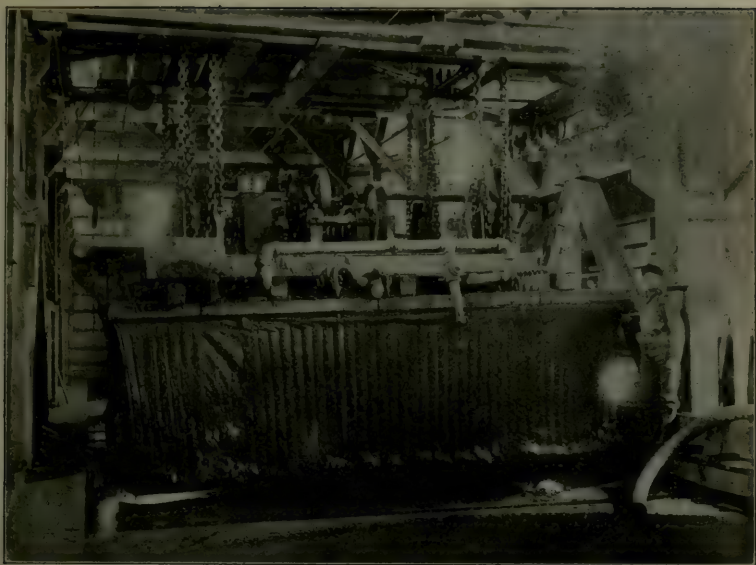
Labor	\$0.926
Supplies—	
25 battery shoes	.039
62 battery dies	.057
2 boss heads	.004
Liners	.011
319 screens	.012
6 mill plates	.034
1,777 ounces quicksilver	.011
Belting	.009
Fire wood	.070
Sundries	.134
Bullion charges—	
Express	.042
Treatment	.020
Distribution accounts—	
Bullion room	.033
Stable	.089
Yard	.100
Power plant	.265
Assay office	.041
Blacksmith shop	.033
Machine shop	.042
Total	\$1.922

Previous to 1905 cyanide treatment had been applied only to such tailings as could be leached with the consequence that over 100,000 tons of tailings valued at about \$5.00 and consisting of about 75% slime had accumulated. In that year the slime plant, erected under the superintendence of T. J. Hoover, began treating the accumulated tailing and also that delivered from the mill. Some of the results of the slime plant are here shown.

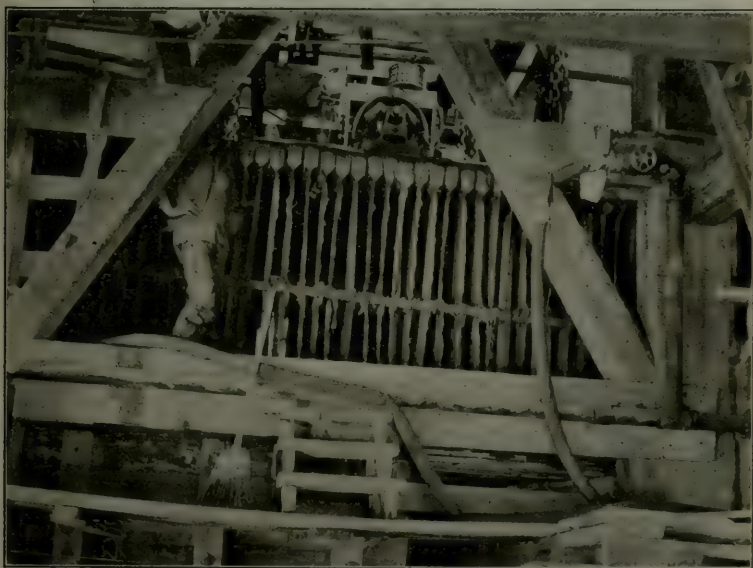
Results of Slime Treatment.

Year	Tons treated besides mill runs	Extraction (per cent)	Cost per ton
1906	7,527	89.4	\$2 43
1907	8,557	88.6	2 78
1908	12,667	90.0	2 48
1909	19,538	87.7	2 73
1910	21,073	88.2	2 01
1911	15,916	90.7	2 64
1912	16,569	89.7	2 10

About 1910 the filter baskets were changed from the Moore to the Butters type of arrangement.



Raised, with cake on, ready to wash.



End view.
Moore Filter Basket, in cyanide plant of Standard Consolidated, Bodie.
Photos by Walter W. Bradley.



Pouring a 2300-ounce bar of gold-silver bullion at Standard Consolidated Mine, Bodie.
Photo by Walter W. Bradley.

Some further details of the slime treatment during 1912 are as follows:

Assay Per Ton.

	Gold	Silver	Total
Tons from mine, 8,024.....	\$5 43	\$0 35	\$5 80
Tons from ponds, 16,568.....	4 83	80	5 63
Tails	61	15	76

Number of tanks charged.....	617
Per cent moisture.....	71
Per cent on 100 mesh.....	31
Tons solution handled.....	101,919
Cyanide, pounds per ton, solution.....	1.5
Lime, pounds per ton, solution.....	.36
Filtering hours—	
Cake, hours.....	2.3
Wash, hours.....	2.6
Hours, cycle.....	121
Cake thickness, inches.....	.79
Tube mill, running hours.....	2,666
Value zinc room solutions, heads.....	\$1.62
Value zinc room solutions, tails.....	.03

Consumption 1912.

	Total, pounds	Pounds per ton ore
Cyanide.....	25,270	1.0
Lime.....	359,870	14.6
Lead acetate.....	2,298	.1
Zinc.....	11,616	.5
Pebbles.....	24,700	1.0

Cost Per Ton, Slime Plant, 1912 (24,593.36 tons).

Labor.....	\$0.854
Supplies—	
Cyanide.....	.269
Lime.....	.192
Zinc.....	.058
Pebbles.....	.020
Lead acetate.....	.013
Belting.....	.007
Wood.....	.031
Sundries.....	.190
Bullion charges—	
Express.....	.052
Treatment.....	.019
Distribution accounts—	
Bullion room.....	.059
Stable.....	.117
Yard.....	.035
Power plant.....	.081
Assay office.....	.024
Blacksmith shop.....	.026
Machine shop.....	.053
Total.....	\$2.10

Interesting, as showing the closeness with which old deposits are now worked, it may be noted that in 1913 lessees were profitably sweeping the top crust from the tailing discharged from the slime plant. The tailing bed was about 10 ft. deep of an average value of \$0.75 per ton, having stood four years. A concentration of values in the top crust, probably by capillary attraction and evaporation, had caused about $\frac{1}{4}$ inch to have a value of about \$15.00 per ton. Four men carefully swept up about 10 tons of this crust per day, which was then run through the company plant.

The future of this property, and to some extent the district, is shown by the following facts. Most of the veins pinch to mere seams at a vertical distance of 500' to 700' from the surface and lose their value

at a depth of 400' to 500', particularly the north and south veins. Deep workings establishing these facts are at the Lent shaft 1200' deep and the Standard shaft 1200' deep, the collar of the Lent being about 200' vertically lower than the Standard.

Lent shaft explorations, in which water now stands at the 521' level, are as follows:

800' level-----	600' of drifts.
1,000' level-----	1,060' of drifts; 1,100' of cross cuts.
1,200' level-----	1,100' of drifts; 1,000' of cross cuts.

This shaft when operated required pumping from 800,000 to 900,000 gallons per 24 hours.

Standard shaft explorations are at present partly open above the 700' level, below that point the following work was done:

700' level—960' cross cuts east, 500' crosscuts west, about 1,000' of drifts in barren ground.
1,000' level—1,140' crosscuts east, 300' crosscuts west, and over 1,000' of other work.
1,200' level—500' crosscut east.

Bibl.: Reports VIII, p. 385, XII, p. 183, XIII, p. 231; Report of Director of U. S. Mint, 1883, pp. 173-175.

Southern Consolidated. This property adjoins the Standard Consolidated on the south and comprises the following old companies: Noonday, Red Cloud, Addenda, Oro, and Defiance (in all 12 claims of which 9 are patented).

Only development work has been done since 1882. At the Noonday, Oro, and Red Cloud there are steam hoists at the shafts, each of which has three compartments. The Red Cloud shaft is about 900' deep, water now standing at 490'. The formation is the same as in the Standard Mine, namely many steep-dipping parallel veins in andesite, making a description of the underground works almost impossible, even if data were at hand. It is stated that about five miles of work has been done.

In the workings at present open, there are several unstoped veins 2'-3' wide said to carry from \$10.00 to \$15.00 per ton in gold and silver. Doubtless mining of these ore bodies will take place at some future time.

Production of the property^a from 1877 to 1888 was,

Noonday -----	\$1,023,289 50
Red Cloud -----	10,927 50
Oro -----	14,155 66
Addenda and Defiance -----	
Total -----	\$1,048,372 66

^aReport VIII, 1888, p. 397.

The fineness of the Noonday bullion varied. The highest percentage of gold by weight being 18.5 in 1880, falling to 8.6% in 1882, the remainder being silver.

Ownership rests with the Southern Cons. Mining Co. J. S. Cain of Bodie, president.

Bibl.: Reports VIII, p. 396, XII, p. 182, XIII, p. 230.

New Bodie Mine (formerly known as the **Syndicate**). This property adjoins the Standard on the north, many of the veins continuing across the line and the same underground conditions prevailing. It was here that the previously mentioned work was done in 1863. There are 3



New Bodie (old "Syndicate") mill and tailings ponds, near Bodie.
Photo by Walter W. Bradley.

patented claims. For many years the mine has been and is now worked principally by leasers whose ore is crushed and leached, during the summer months, at a 20-stamp, steam power, mill on the property. The work has been profitable (leasers usually making fair wages), by opening up new veins near the surface and of comparatively short extent. A number of adits open the ground, the lowest being about 700' vertically below the croppings. A quotation from H. A. Whiting¹⁰ shows some of the conditions—"Not only have these younger lodes their largest development in the Standard Mine, but they have there been the most productive. North of that they are more numerous, but

¹⁰Report VIII, p. 338.

smaller. In the Syndicate mine, on the extreme north end of the mineral belt, the veins become unproductive at a horizon about 50 feet below the Osceola tunnel; or, about 250 feet below the croppings on Bodie Bluff. This mine has been thoroughly prospected east and west at two localities, over its whole width of 1200 feet, by crosscuts from the Syndicate tunnel which is 500 feet below the Osceola tunnel. Numerous small veins of quartz are met with in these crosscuts, but they are all barren of ore, or so nearly so as not to repay extraction."

At the end of 1888 a total production of \$584,711.21 was reported, dividends having been \$48,308. and assessments \$38,728.75. Percentage by weight of gold in the bullion varied from 33 to 45. From 1892 until 1906 the production is said to have been about \$30,000 per year from ore averaging \$12.00 per ton.

Bibl.: Reports VIII, p. 387, XII, p. 184, XIII, p. 232; Report of the Director of the U. S. Mint, 1883, p. 175.

MASONIC DISTRICT.

This district lies about 16 miles, by wagon road, northwest of Bodie and about two miles distant from the California-Nevada boundary line, at an elevation of about 8,000'. It is the most recent camp in the country where any considerable amount of work has been done, and this together with the fact that ore of high grade has been mined makes its description important.

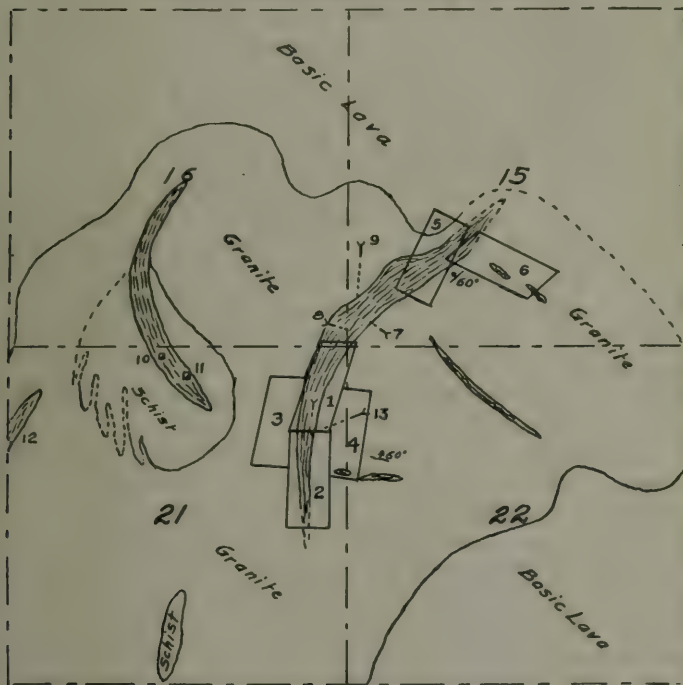
Masonic and the neighborhood has been known slightly for many years and some prospecting had been done, but discovery of valuable ore took place August 1, 1902, when J. M. Bryan, Kaleb Dorsey, and J. S. Phillips made locations on what has since been called the Pittsburg-Liberty Mine. They had followed numerous croppings of white ("bull") quartz veins, in the granite, without good results and finally panned some of the dark porous croppings prominent in the neighborhood with encouraging results. The three partners were old-time miners who regularly spent a portion of their time working for wages and the remainder in prospecting.

Not until three years after the locations were made was ore in workable quantity or value found, and no considerable production was obtained until 1907 when they shipped to the Selby smelter near San Francisco, a car load of ore (17 tons) which netted them \$1040 per ton. This was the product of five men's work during the summer and at a depth of only 15 feet. An option was given to George Wingfield and a payment of \$47,000 received. The option resulted in sinking a 100' shaft and driving a 47' crosscut. However, title did not pass from the locators due to their not consenting to alteration of terms and they, upon taking charge of the property, again shipped ore to the

amount of three carloads, the poorest of which gave them a profit of over \$700 per ton.

The **Pittsburg-Liberty Mining Company** was formed and a 10-stamp steam power mill was erected about a mile down the cañon. The mine, operated until 1910, reported production being \$600,000 to \$700,000 and has since been idle. No very large profit is said to have resulted and the corporation is at present bankrupt. This is remarkable when it is considered that the maps show only about 6000' of drifts and crosscuts.

Plate IV. Masonic Mining District, Mono County.



Sections 15, 16, 21 & 22

T6N-R26E-M.D.

- | | | |
|---------------------------|--------------------------|-----------------------------|
| 1. Pittsburg claim. | 5. Hermine claim. | 9. Home View adit. |
| 2. Liberty claim. | 6. Jump-Up-Joe claim. | 10. New York shaft. |
| 3. Liberty No. 2 claim. | 7. Rough and Ready adit. | 11. Sarita shaft. |
| 4. Pittsburg No. 2 claim. | 8. — adit. | 12. Lost Horse shaft. |
| | | 13. Pittsburg-Liberty adit. |

Several veins or zones were stoped, most of them dipping at angles from 70° to 90° . The greatest depth stoped below the croppings was about 150'. The lower works being obstructed at the time of this examination no observations could be made as to the geologic reason

for loss of value. Assay plans show very irregular shapes and values of the ore bodies. Most of the value is gold, some ore running as high as \$300 per ton and from inspection of assay plans it seems probable that the average value was about \$20. No machinery was used in the mine. Stopes and drifts were supported by nut pine timber from the surrounding hills. Chutes to the lower adits furnished outlet to the wagon road running to the mill. Timber is cut under permit from the U. S. Forest Service at an average price of \$1.75 per cord. The accompanying sketch shows the amount of underground work on the four principal levels. Some of the most noticeable facts indicated by the map are: five veins striking N. 25° W. and dipping to the east, developed upon the upper or 130' level; three of them developed on the second or 172' level; exposure by one crosscut under the entire group of veins on the third or 271' level; and the lower tunnel or 413' level cuts almost all of the mineral zone about 100' south of the most productive portion. An area 300' square covers most of the workings.

The east wall of the silicified zone, according to description by J. M. Bryan, is shown on the map of the 413' level. North of the main tunnel the general dip is said to be toward the east while on the south side of the tunnel the dip is westerly. Horses, of granite are said to have been common in the mineralized or silicified zone.

Possibility of extension of known ore bodies or other finds is the most important economic question relating to the district. The geologic features and positions of some of the prospecting works are shown on the accompanying map of the district.

The **Serita Mine** is a property upon which recent interest has centered. It lies almost a half mile west of the Pittsburg-Liberty, and is owned and operated by F. W. and Geo. C. Stall. A vertical shaft 218' deep and two crosscuts, 100' north and 80' south, on the 100' level are the principal workings. A gasoline hoist with buckets constitutes the equipment. The ore, as seen in the shallow surface cuts, is porous chert and chalcedony accompanied by breccia similar to the Pittsburg-Liberty ore. Walls are indistinct and difficult to identify but there seems to be from 4' to 10' of ore which is said to carry free gold from \$3 to \$40 per ton. North from the Pittsburg-Liberty the following work has been done along the silicified zone:

Jump-Up-Joe Mine. This property is owned by the **Field of Gold Mining Co.**, of which W. A. R. Loose of Bodie is manager. The croppings of close-grained brown and black quartzite carry considerable coarse gold, readily distinguished by the naked eye. An adit of about 100' length runs southwesterly into the silicified rock with a winze about 50' deep near the entrance. Little or no work has been done since the early days of the camp. No considerable production by the company is reported.

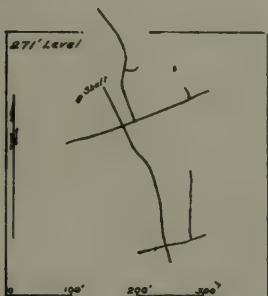
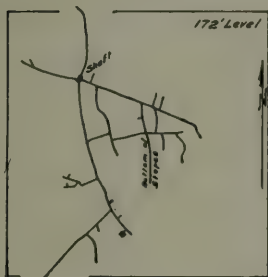
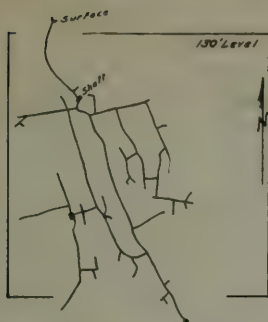


Plate V.—Pittsburg-Liberty Mine, Masonic District.

Hermine claim is owned by August Seiler. A number of short adits and shafts have been opened by the owner and other parties working under option. The prominent croppings of quartzite previously mentioned contain most of the surface works on this claim. Little or no ore has been extracted.

Rough and Ready Mine. An adit in search of a northward extension of the Pittsburg ore, stands open for a distance of about 300' running N. 55° W. Only granite is exposed with the exception of a 10' dike of dark fine grained rock, dipping N. 65° W. at an angle of 48° at 180' from the entrance. There is no evidence of alteration or movement except a clay seam on the west side. Adjoining the Rough and Ready but on the opposite side of the hill near the summit, an adit runs in S. 70° E. a distance of 350' all the way in the silicified rock.

Home View Mine. Near the west side of the silicified zone but in the granite the Home View adit was run in a southerly direction about 900'. No ore is reported to have been encountered and the appearance of the dump indicates that most of the work was in granite or blue clay gouge.

It will be seen that a northward extension of the ore bodies has not as yet been exposed.

Toward the south the zone does not extend much beyond the Liberty claim, gradually dying out in the granite. Numerous surface trenches in this vicinity have not developed ore.

To the east of the Pittsburg-Liberty zone there are numerous smaller silicified zones having an easterly and westerly strike in the granite. Several of the larger ones are shown on the map. Considerable work in this area has been done without favorable results.

New York Mine. This claim is near the Serita in the same zone. A shaft was sunk about 50' and some surface work done. Spots of ore of good value have been reported.

Lost Horse Mine. This claim is situated on one of the smaller but prominent zones shown on the map. A great deal of trenching was done and a shaft sunk about 50'. No important results are reported. The croppings are of quartzite and breccia very much stained with iron. The marked difference in appearance from the payable ore on nearby claims is the absence of chalcedonic quartz.

There are similar geologic occurrences farther toward the west, in Sec. 20. Locations have been made which are said to show some ore. Among the more prominent are the two following:

Lake View Mine. The claim is situated west of the center of Sec. 20 on the west hill slope. Development work consists of an adit 176' long with various winzes and raises, all in silicified rock. There is 25' of ore exposed on the surface said to average \$4 per ton. J. M.

Bryan is one of the owners. It is contemplated that a small mill will soon be built.

Red Rock Mine. In the northern part of Sec. 20, on one of the silicified zones. A 50' shaft, and several adits about 25' long comprise the work done. There is said to be some pay ore exposed at present. Owner, Jas. Logan.

Several properties at various points in the northern portion of the county have been developed and merit description. Most of them were visited previously by the writer.

Golden Gate Mine. Situated near Coleville, in Sec. 26, T. 8 N., R. 22 E. Formerly owned by Golden Gate Mining Co., of which Joe A. Brown was president. Two veins dipping S. 60° W. in schist and slate at an angle of 38° have been stoped for distances of 105' and 160' for a height of 60' at an average width of 4'. Five adits furnish entrance to the mine. Their lengths in order from the lowest to the uppermost are 1800', 640', 1200', 300', and 100'. Equipment comprises a 10-stamp mill, without concentrators, operated by water power. Water available is said to be 33 miner's inches with a fall of 538'. An aerial tramway 2300' long carries ore from the mine down to the mill. The property has been operated several times under option to purchase. The last results of such operations, from Sept. 1, 1912 to April 13, 1913, are reported by the owner as follows: Tons crushed 6848, yielding \$33,646.47 at a cost for tramming and milling of 42¢ per ton.

Operations are expected to resume shortly.¹¹

Al Mono Mine is 3 miles southeast of the Golden Gate, working three men, adit 800' long, ledge said to be 2' wide and in 1902 to have yielded \$300 per ton on a three-ton shipment. Operators afterward relinquished their claim to the property. Present owners, J. A. Shirley et al. Ore carrying gold, silver, and lead is reported of recent discovery by Ed. Davies of Topaz, near the summit of the Sweetwater Range and about two miles northeast of the old Lindsey marble quarry.

About two miles southeast of the Golden Gate mine Dr. O'Connor of Coleville has recently been engaged in opening an adit on a prospect.

PATTERSON DISTRICT.

The district was active from 1880 to 1884 over an area extending about six miles north and south, (between Frying Pan and Sweetwater Cañons) and three miles east and west having produced about \$500,000.¹²

Among the properties in the Patterson district are the following upon which information has been obtained:

Silverado Mine is situated on the west side of the Sweetwater Valley, about three miles from the Nevada-California boundary line

¹¹See also p. 140, *ante*.

¹²Report VIII, 1888, p. 361.

in Sec. 19, T. 7 N., R. 25 E. The property comprises 8 unpatented claims owned by Columbia Cons. Mines Co., John J. Phelan, Pres., 123 Sanford Bldg., Bridgeport, Conn. The ledge dips westerly at an angle of about 30° , having a width of from 2' to 5'. There are three adits on the vein, the upper being 150' long, the middle one 800', and the lower 600'. Values are in the form of silver chloride occurring in spots. It is said that previous to 1896 there was a total production of \$20,000, the ore being packed out on mules, and that since then possibly \$5,000 has been produced. During recent work under an option, which lapsed, sampling results showed 28 inches of ore running between \$15 and \$30, about 500 tons of sorted ore on the dump averaging \$25. Smelter assay certificates dated 1911 showed the following results:

Sorted ore, 0.29 oz. gold; 241.01 oz. silver. Concentrates, 0.47 oz. gold; 1484.18 oz. silver.

The equipment consists of a 10-stamp, steam power mill and percolation cyanide plant.

Bibl.: Rep. of Director of U. S. Mint, 1883, p. 176.

Star and Great Western Claims. Situated in Sec. 14, T. 7 N., R. 24 E. near the summit of the Sweetwater Mountains at the head of Sweetwater Cañon. Two patented claims, owner Martin Jones, 634 Ashbury street, San Francisco. No production is reported but a mill test of five tons of sorted ore from the last-mentioned claim is said to have returned 47 ounces of silver per ton (85% extraction). The vein is said to be 4' to 11' wide cropping for 700' dipping N. 76° E. An adit 135' on the vein and 9 open cuts, 75' apart, constitute the development. On the Star are two veins 3' wide and said to assay about 20 ounces in silver per ton. An adit 85' on the vein and a 35' winze are the developments in ore.

Summers Consolidated Mine is near the head of Ferris Cañon. Four patented claims owned by Mrs. Jas. Acheson of Sweetwater, Nev. A 5-stamp mill was operated until October, 1885. Reported production about 5100 tons of ore yielding \$254,446. Several adits were opened, the longest being 1240' and the vein was developed for 700' on the dip (dip 65° except in lowest works where it is steeper). Two shoots each about 125' long and 3' wide were opened. Ore was packed to the mill, nothing less than \$18 (silver at \$1.29) was taken. These figures were kindly furnished by Mr. Martin Jones who was superintendent during final operations.

On the eastern flank of the Sierra Nevada Mountains at an elevation of about 9000' are two properties upon which some work has been done as follows:

Dunderberg Mine. Situated a mile south of Green Creek, Sec. 19, T. 3 N., R. 25 E. Patented, recently sold to the state for unpaid taxes.

Two crosscut adits were run, one being about 900' long and 200' above the other which is 1700' long. A winze 100' deep was sunk from the lower adit and a great deal of drifting was done on the vein in various places. An adit was started on Green Creek about 800' lower, to tap the vein but was run only 500'. The ledge dips westerly about 45° having a width of 3' in the upper tunnel and 9' in the lower. Some of the ore near the surface is said to have carried values in gold as high as \$20 to \$40 per ton. A great deal of iron sulphide was encountered (said to be over 50%), and a heavy flow of ice cold water.

A 20-stamp mill, driven by water power, with 5 Frue vanners and a chlorination plant, were erected. No work has been done since 1902.

Bibl.: Reports XII, p. 178; XIII, p. 227; Min. Res. W. of Rocky Mts., 1873, p. 16.

Ward Mine. One mile south of the Dunderberg; Sec. 30, T. 3 N., R. 25 E. The vein is 16"-24" wide, in granite and dips 60° south. Work done is as follows: 210' incline shaft; adit 210' long at the 100' level, where there are drifts 150' and 100' west and east respectively, each showing ore for about 40' from the shaft. A 4-stamp water power mill is on the property. Ownership has changed frequently, the last relocater being E. L. Page.

Bibl.: Report XIII, p. 232.

MONO LAKE, WEST SHORE AND VICINITY.

This very interesting region has been thoroughly described by Israel C. Russell¹³ and only slight mention will be made of the various formations as shown on the accompanying map.

A portion of the *Metamorphic* series and all of the *Basic Lava* formations are extensions of the areas in the Bodie and Masonic region and are described under that head. The most noticeable feature in the metamorphic series as seen in the region now under consideration is that the sedimentary origin is clearly shown. In some places, as west of Lundy, it distinctly shows stratification and yet is so dense and fine grained as to resemble an igneous rock. About a half mile east of Lundy are seen large conglomerate boulders containing pebbles, mostly quartz or quartzite, from ¼" to 8" in diameter cemented in a ground mass which is entirely schistose. The pebbles are mostly oblong in shape but show little fracturing. Along the steep hillside north of the mouth of Mill Creek Cañon the series contains hard bedded limestone. In Levining Creek Cañon, about four miles from the mouth, is coarse crystalline calcite and on Williams Butte near Crater, is an outcrop about 50' long of white quartzite, closely resembling

¹³U. S. G. S., 8th Annual Report, Part I, pp. 261-394.

marble. The *metamorphic* series has in places been found to contain gold bearing veins.

The *granite* which contains a number of gold bearing quartz veins varies from coarse-grained, light-colored to fine-grained, dark-colored granodiorite. It is frequently intruded by dikes. The contact between the granite and metamorphic is usually sharp and distinct but in some places particularly in Levining Creek Cañon they are in a confused condition.

Glacial drift is chiefly composed of granite boulders and sand of all sizes indiscriminately piled together. Near the mouth of Mill Creek Cañon, near the center of Sec. 13, T. 2 N., R. 25 E., an unsuccessful attempt was made to wash this glacial gravel with hydraulic giants for its supposed gold content.

The *Lake Deposit* varies considerably from place to place. According to Russell it contains marl, clay, and diatoms in many places, more particularly on the eastern side of Mono Lake. Along the western side of the lake it contains more sand, gravel, and volcanic ash. He mentions measurements of exposures 200' in thickness and states that the total thickness must be much greater. The margin of the deposit as shown on our map follows closely the old shore line of Quaternary times, when the surface of the water was over 700' above its present position. During 1908 two efforts were made to obtain oil by drilling in this formation. One well near Dechambeau's ranch is about 900' deep and one near the southwestern shore of Paoha Island is about 1500' deep. Both struck hot water. The only indication of oil in the region, so far as known to the writer, is a spring near the eastern shore of Paoha Island, and the negative evidence afforded here is shown by a quotation from Russell¹⁴ "On the west shore of Hot Spring Cove another thermal spring, called Petroleum Spring, on account of its odor, rises at a point a few feet above the lake margin and discharges a few gallons of water a minute. Its temperature is 96° F. A partial analysis of its water shows that it contains 0.8775 grams of solid matter to the liter, consisting of carbonates, chlorides, and silicates of calcium, magnesium, sodium and potassium." Such a careful observer would scarcely have omitted to mention the fact had there been any evidence of oil other than the odor. There is little or no reason to suppose that any other drilling in the basin would give more satisfactory results than obtained at the two wells mentioned.

The most important mineral product found in the *Lake* deposit is lime. At many points it occurs in the form of tower-shaped deposits around old springs. Along the lumber railroad running to Bodie are

¹⁴U. S. G. S., 8th Annual Report, Part I, p. 289.

several such deposits. One of them has been quarried for many years and burned in a kiln. It has supplied practically all the lime used in the cyanide plants of the surrounding country. Owner, T. Moyle of Bodie.

The isolated position of the lake and its seldom visited islands have, since the time of "Mark Twain's" earliest writings, afforded ample opportunity for fiction regarding their rare mineral deposits. Occasionally the fiction is intended for that large class of readers classed as investors.



Mono Craters, Mono County, from east side. Photo by Walter W. Bradley.

The *Recent Volcanics* are composed of basaltic lava flows, cones or craters of volcanic ash, as in the Mono Craters, or pumice and accompanying flows of obsidian or volcanic glass, all of which have been minutely described by Russell. No economic importance attaches to these at present, with the possible exception of the vast supplies of pumice which may at some time be called upon for structural or other purposes. Pieces of almost any density, from the glassy form to the porous, which is lighter than water, can be obtained in sizes ranging from dust up to several feet in diameter. The finer fragments form part of the soil along the southern shore of the lake, which produces hay and similar crops upon being irrigated.

The waters of the lake are strongly alkaline, containing about 5% of salts, principally sodium chloride, carbonate, and sulphate. Several

tons of this salt are reported being obtained annually by evaporating over fire. The reported price paid at the point of production was \$0.10 per pound, to be used for medicinal purposes.

In former times the salt was used at Bodie in amalgamating pans to keep the quicksilver clean.

The forest near the southeastern shore of the lake furnishes lumber and mining timber for most of the surrounding country, being delivered by railroad to Bodie and thence distributed by team. Preparations are under way to more extensively irrigate the lands surrounding the lake, which are fertile where water is available, climatic conditions being considered.



Crystal Lake Gold Mining Company's Mill in Lake Cañon, near Lundy, Mono County. Elevation, 9500 feet. Photo by Walter W. Bradley.

The principal and practically the only mineral resource that has been exploited in the region are those of the gold-bearing formations. All the mines upon which any great amount of work has been done with recent years are here enumerated.

The **Crystal Lake Mine** (formerly known as the **May Lundy**), two miles above Lundy, is the largest mine in the neighborhood of Mono Lake. The deposit was discovered in 1879 and has been operated a large part of the time since then. Previous to 1888 the total production was about \$876,000 and from that date until the present, it is estimated by R. T. Pierce, who has been manager of the property for

many years, to have been from \$1,700,000 to \$2,000,000. All records, however, were destroyed by fire a few years since.

Two veins, the May Lundy and West, are covered by a patented claim and about 20 locations. The May Lundy vein can be traced for some 6000' and the other for about half that distance. The country rock is granite, in which the veins dip westerly at an average angle of 45° .

An adit about $\frac{3}{4}$ of a mile long cuts the May Lundy vein about 1500' from the outcrop. In the upper levels the vein is about $2\frac{1}{2}'$ wide and in the lower levels is about $3\frac{1}{2}'$ wide. Drifting on the various levels has been done as follows: No. 1 tunnel, 100'; No. 2 tunnel, 900'; No. 3 tunnel, 1400'; Lake View level, 3100'; and about 1400' on a level 200' above the lowest adit. A great deal of stoping has been done.

Equipment is most complete. A 20-stamp mill is situated near the main adit. Electric power is supplied from a nearby stream falling 1000' in a very short distance. Gold and a very little silver is carried in hard white quartz. The property is at present idle and it is impossible to obtain as much information as would be desirable. The writer is familiar with the property, however, from previous work.

Severe winters are the most serious obstacle to operations, the elevation being from 8000' to 11,000' at different parts of the property. The mine may be expected to appear on the producing list for some years in the future.

Log Cabin Mine. Situated in Sec. 1, T. 1 N., R. 25 E., at an elevation of about 9000'. Owners, H. H. Clark and Luther G. Brown of Los Angeles. It comprises 15 unpatented claims, which were located in 1908. The country rock is metamorphic slate and quartzite. The principal ledge of quartz is about two feet wide, with a northwesterly course. About $\frac{1}{4}$ mile SE. of the NW. corner of the section, an adit was driven approximately 300' long, southerly along strike of formation to gain depth under an 80' vertical shaft about $\frac{1}{4}$ mile farther south, which was sunk in quartz croppings about 2' wide. A gasoline hoist is being erected on this shaft. About $\frac{3}{4}$ of a mile southeast from the adit is an old 40' incline shaft sunk on 2' of quartz, dipping NE. at an angle of 80° . Machinery and supplies are hauled from Benton, a distance of 50 miles, at a cost upwards of \$0.65 per hundred pounds. Very rich float rock has been reported in this vicinity and the recent activity on this property has given it considerable local importance.

About a mile north from the Log Cabin are several old prospects upon which a little work has been carried on for years, among them are the following:

Charleston Mine. Situated in N. $\frac{1}{2}$ of Sec. 36, T. 2 N., R. 25 E. Owner, J. P. Hammond of Mono Lake. This property consists of eight unpatented claims; discovered in 1886. Several adits have been run in the crushed and broken slate. The lower is the longest, running northerly about 500' and having over a 100' of branching drifts and crosseuts. In places there is 2' of quartz. The upper adit and branches total about 200', showing from 1" to 12" of quartz in places. There are other shallow works still higher. A small stamp mill adjoined the lower workings, but was recently destroyed by a snow-slide. No considerable production is reported.

Bibl.: Reports VIII, p. 385; XII, p. 177; XIII, p. 227.

Golconda Mine. Situated in S. $\frac{1}{2}$ of Sec. 36, T. 2 N., R. 25 E. Owner, John Mattly et al. of Mono Lake. Development consists of several hundred feet of adits in the crushed slate formation. There are four unpatented claims. No production.

North of Mill Creek Cañon on the steep mountain flank facing Mono Lake are several old properties in what was previously known as the Jordan District. Considerable work was done here, particularly on the Goleta.

Goleta Mine. NE. $\frac{1}{4}$ of Sec. 11, T. 2 N., R. 25 E. Owner, J. S. Cain of Bodie. Seven patented claims. A 40-stamp mill was erected in 1896 and a great deal of development work done, one adit alone being 1500' long. Operations ceased in 1901 and practically all equipment was removed. No account is to be had of the ore extracted in paying quantity.

Bibl.: Reports XII, p. 178, XIII, p. 228.

The **Parrett Mine** is about one mile west of Lundy, SW. $\frac{1}{4}$ of Sec. 19, T. 2 N., R. 25 E., and consists of 11 unpatented claims. Owned by Jasper Parrett estate. For thirty years it was worked by the owner, mostly by surface cuts, the longest adit being 200'. Ore was packed by burros to an arrastra operated, during the summer, by an 18' overshot water wheel. Capacity of the arrastra is from $1\frac{1}{2}$ to 3 tons per 24 hours. Ledges are from 8" to 7' wide, but only the smaller ones were worked, they are in metamorphic rock near granite. The ore is a hard, white quartz bearing free gold, galena, and pyrite. No accurate report of production is to be had, but it seems to have been enough to have supplied all necessities to the owner since the discovery in 1877.

Bibl.: Reports XII, p. 182; XIII, p. 230.

Casa Diablo Mine is situated in Secs. 21 and 22, T. 4 S., R. 32 E., 22 miles from Bishop by wagon road, nearest railroad station Hamil. Owned by Sierra Development Co., Chicago, Ill. Consists of 14 unpatented claims, discovered in 1895. Work was discontinued in 1911.

Total production of gold and silver is said to be about \$50,000, most of which was turned out in 1910.

There are three ledges between granite walls dipping north at an angle of about 58° from horizontal, their widths vary from 8" to $2\frac{1}{2}'$. The average value is said to be \$12 per ton, some running as high as \$20. About 70% of the values are reported to be free milling, while the remainder is contained in sulphides, of which there is about 3% in the ore.

Development work consists of an adit 1600' long and about 4000' of drifts. Equipment consists of a 100 h.p. electric plant with 4 miles of transmission line; a 10-stamp mill with one Frue vanner, and a leaching plant. There is a 20 h.p. hoist and a compressor supplying 3 Lyner drills. Eight miles of pipe bring water from Rock Creek. There is also a saw mill providing lumber from pine timber 3 miles distant. Mine timber is supplied by piñon trees growing upon the property.

TRAVERTINE.

About one mile southeast of the town of Bridgeport is a deposit of travertine worthy of note. The property is patented and belongs to the California Travertine Co., E. P. Gray of Los Angeles, president.

In 1895 a quarry was opened and some of the rock shipped, principally for work on the City Hall at San Francisco. Two slabs $4\frac{1}{2}' \times 6'$ were the largest of which there is record. The quarry is at the south end of the deposit and consists of an open cut about 200' long, 20' wide and the same depth. About 10' of soft overburden covers the hard rock. A tunnel, now caved, at one time drained the cut, which is now partly filled with water. There are some 50 rough pieces on the dump and a few roughly dressed having the following dimensions: $3' \times 6' \times 2\frac{1}{2}'$. The stone has a handsome appearance, being red to brown in color with fantastic figures. The deposit is about a half mile long and a quarter of a mile wide, nearly surrounded by older basic lava hills. The southern exposure forms a sloping bluff about 200' above the creek bottom which drains the locality. Springs and marshy ground occupy the central portion of the deposit. A soft, friable local deposit is still forming at the eastern margin of the main deposit where hot springs arise. The recent deposits are in the form of ridges several hundred feet long coursing northeast and southwest. A cross section of one of these ridges is semicircular, the height and base each being about 30 feet. A crevice, about a foot wide and from 1' to 4' deep, follows along the crest of each ridge, carrying hot water from the springs. That these crevices are probably developed by the

settling of the sides of the ridges is indicated by the parallelism of the tortuous sides.

Bibl.: Report XIII, p. 640; U. S. G. S. Water Supply Paper 338, pp. 132-136.

MINERAL WATER.

There are a number of mineral springs in Mono County, some of which would become popular resorts were they accessible to a larger population. Among these have already been mentioned Fales Hot Springs, near Bridgeport, and the springs around Mono Lake. The following is a list of mineral springs of the county:

Artesian Springs, at Oasis, owned by J. H. Forman, Oasis. Used for irrigation.

Banner Spring, in the Inyo National Forest, 11 miles west of south from Benton. Used for domestic purposes.

Benton Hot Springs, 300 yards northwest of Benton postoffice, owned by the Benton Mining Co. Used for irrigation.

Bertrand Ranch Springs, 6 miles east of north from Benton. Used for irrigation.

Black Lake Springs, 2 miles north of west from Benton, owned by Peter Gilhoed. Used for irrigation.

Buckeye Hot Spring, about $5\frac{1}{2}$ miles south of west from Bridgeport, on the north bank of Buckeye Creek, and in the Mono National Forest. Temperature 140° F. Used occasionally for bathing.

California Travertine Co. Spring. (See under Travertine.)

Casa Diablo Hot Springs, 45 miles northwest of Bishop.

Fales Hot Springs, 13 miles northwest of Bridgeport, Samuel Fales, owner. It is on the road to Minden, Nevada. The temperatures range from 129° F. to 141° . There is a stage station and hotel there, and the springs are also utilized by camping parties.

Mono Basin Springs, at several points in and around the edge of Mono Lake.

Moran Spring, 13 miles west of south from Benton, in the Inyo National Forest.

River Spring, 10 miles west of north from Benton. A. Matlock of Bishop, owner. Used for irrigation.

Whitmore Tub Springs, in Long Valley, 38 miles northwest of Bishop. Unused.

Bibl.: U. S. G. S. Water Supply Paper 338, pp. 132-136, 145-147, 322, 336-337.

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PART II

The Counties of

Butte, Lassen, Modoc,
Sutter and Tehama

By W. BURLING TUCKER and CLARENCE A. WARING, Field Assistants

PREFACE.

The counties presented in the grouping herewith, really comprise two groups, geographically: one, Butte, Sutter and Tehama in the central and upper Sacramento Valley; and the second, Lassen and Modoc, on the eastern side of the Sierra Nevada Mountains, at the northeast corner of California. The first three are important agricultural counties, with Butte County also an important producer of gold and timber. The last two counties, being more mountainous, their principal industries are cattle raising and mining. Being east of the Sierra Nevada divide, Lassen and Modoc belong in part to the Great Basin Region which covers the State of Nevada.

We have endeavored to list all mineral properties, both active and prospective, and desire to here express our appreciation to the many owners and operators, whose co-operation and courtesy have assisted in the preparation of this report.

BUTTE COUNTY.

By CLARENCE A. WARING, Field Assistant.

INTRODUCTION.

The field work in Butte County was completed in December, 1916. About three weeks were spent along a route including Chico, Center-ville, Nimshew, Hupps, Magalia, Stirling, Cherokee, Oroville and Forbestown. Many of the mines were visited and information was obtained concerning many of the old mines and prospects. Mention is made of all mines both operative and inoperative with a hope that a word about the development of old properties may enlighten new prospectors.

Appreciation is here expressed to the owners, superintendents and miners for their kindly assistance and co-operation in helping to bring this report up to date.

DESCRIPTION.

Butte County is located in the north-central part of the state. It is bounded on the north by Tehama and Plumas counties, on the south by Sutter and Yuba counties, on the east by Plumas and Yuba counties, and on the west by Glenn and Colusa counties. It has an area of 1764 square miles supporting a population, in 1910, of 27,301. Oroville, the county seat, originally incorporated in 1857, has a population of 3859, while Chico, originally incorporated in 1872, has a population of 3750.

The county includes a considerable area of flat low valley land, east of the Sacramento River and northwest of the Feather River, which produces grain, rice, hops, alfalfa, and citrus and deciduous fruits. Clays in this portion of the county are available for the manufacture of brick, and certain gravels are being dredged for gold. The north-eastern portion of the county extends into the Sierras and in places reaches an elevation of 7000 feet. In this upper portion of the county mining and timbering are the principal industries, although a few apples, berries, etc., are grown.

Power.

The greater part of Butte County is well provided with electric power, since four companies are in the field.

The Northern California Power Company has a line entering the northwestern part of the county and extending to Chico and westward into Glenn County. Their generating plant is in Shasta County, on a branch of Battle Creek, near Manton.

The Oro Electric Corporation, with generating plants on the upper Feather River, has lines extending southward through Yankee Hill and Oroville to a point northwest of Honcut, where they turn westward across the county with branches to Gridley and Biggs.

The Pacific Gas and Electric Company has generating plants at De Sabla and Centerville on Big Butte Creek supplied by water from Round Valley, Coneow and Hutchinson reservoirs. Power lines extend from Centerville to Oroville and southwestward into Yuba County; also from Centerville southward into Sutter County with branch lines to Biggs and Gridley.

The Great Western Power Company with generating plant at Las Plumas on the Big Bend of the North Fork of the Feather River has a trunk line southward, along a line 4 miles east of Oroville, to Sacramento. No power is at present distributed in Butte County from this line.

Transportation.

The county is well served by railroads and roads.

The Northern Electric Railroad enters the county from the south, passing through Rio Bonito, Tres Vias and Durham to Chico, with a branch from Tres Vias to Oroville.

The Southern Pacific enters the county from the south through Gridley, and crosses the western side of the county through Biggs, Nelson, Chico, Nord and Cana with a branch line from Chico, up Big Butte Creek, to the Diamond Lumber Mill at Stirling. This company also has a line entering the county through Honcut, running northward to Oroville and extending up the east side of Feather River, into the timber lands, with terminal at Brush Creek.

The Western Pacific Feather River route enters the county from the south, passes through Oroville, and follows the Feather River and its North Fork into Plumas County.

The main state highway has been ordered surveyed paralleling the Southern Pacific Railroad through Gridley, Biggs and Chico, while the portion northwest of Chico has been laid out. Good macadam roads have been built in the western portion of the county, while fair mountain roads have been graded in the eastern, more mountainous portion.

GEOLOGY.

The bedrock series of the higher portion of Butte County is made up principally of granite and granodiorite, which have intruded the older diabase and amphibolite with their overlying slates, quartzites and limestones of Carboniferous age. The amphibolite lies in a belt generally with NW.-SE. trend along the west side of the granitic area.

The series has in places been intruded by basic serpentine and acid quartz veins. Considerable areas are covered by sediments, including auriferous gravels, and volcanic rocks. The volcanic series consists of an older basalt overlain by andesite conglomerate, tuff and breccia, all of Tertiary age and in places overlain by a later basalt or dolerite of probable Pleistocene age.

The western portion of the county consists largely of alluvial gravels, sands and clays sloping gently from the foothills towards the Sacramento River to the west.

MINERAL PRODUCTION.

Since 1880 Butte County has produced brick, chrome, copper, diamonds, gold, lead, limestone, mineral paint, mineral water, platinum, silver and stone.

The production of chrome increased very decidedly in 1916, but several of the properties have since been worked out. The copper, lead and silver were recovered by the smelter, from gold ores. The diamonds are found in the cleanups from placer gold gravel.

The dredgers in the region about Oroville have kept up the gold production for several years. Gold production apparently reached its height in 1908, when gold to the value of \$3,139,398 was produced. Since then the production has gradually diminished until now it is slightly more than half what it was in 1908. Platinum is recovered from the dredger gold in the process of refining.

The following table of mineral production in Butte County covers the industry since 1880, the earliest time for which production figures are available:

TABLE OF MINERAL PRODUCTION OF BUTTE COUNTY.

Year	Copper		Diamonds. value....	Gold, value....	Lead		Mineral water		Platinum		Silver, value....	Stone industry		Unapportioned		
	Pounds	Value..			Pounds	Value..	Gallons	Value..	Ounces	Value..		Material and amount	Value..	Mineral	Amount, tons....	Value..
1880				\$430,501							\$1,247					
1881				650,000							1,000					
1882				650,000												
1883				630,000												
1884				680,000												
1885				672,500												
1886				728,100							3,700					
1887				632,902						13	6					
1888				550,000							500					
1889				606,028							518					
1890				208,077							5,815					
1891				304,765							229					
1892				316,000							610					
1893				307,351							5,504					
1894				473,073												
1895				607,261							8,936					
1896				749,316			1,000	\$775			5,300	Brick, 700 M			\$4,200	
1897				607,025			2,100	900			7,885	Brick, 250 M			1,500	\$3,000
1898				514,508			2,085	900			9,317	Brick, 300 M			1,800	900
1899				480,846			1,240	1,240			5,069	Lime, 600 bbls			600	9,900
1900				485,589			15,000	1,515			13,062	Brick, 900 M			7,200	
1901				804,078			10,400	1,455			4,634	Brick, 800 M			1,500	
1902				916,782			14,000	1,500			2,219	Lime, 400 bbls			5,000	
1903				1,571,507			13,000	1,550			838	Brick, 1,200 M			750	
1904				1,982,552			12,600	1,512		\$210	2,302	Brick, 250 bbls			2,200	
1905				2,607,500			15,000	1,500		1,000	7,134	Brick, 400 M			4,020	
1906				3,016,747			19,500	1,950	110	1,770	10,853	Brick, 130 M			3,200	
1907				2,786,840			21,400	2,140	26.4	475	8,907	Macadam, 18,176 tons			1,300	
1908				3,139,398			22,450	2,450			12,708	Brick, 200 M				
1909				2,987,079			25,400	1,400			7,205	Macadam, 131,880 tons				
1910				2,487,791	645	\$27					6,429	Miscellaneous		Unapp. 1900-		
1911			\$150	2,323,396							5,102	Miscellaneous		1909		107,170
1912				2,346,229							5,567	Miscellaneous				
1913			175	2,269,849			1,000	250			5,163	Miscellaneous				
1914			100	1,700,000	513	20	1,200	300			4,000	Miscellaneous				
1915		11	\$2	1,545,976	90	4	5,000	850	126	3,997	3,433	Miscellaneous		Chrome		540
Totals...	11	\$2	\$725	\$24,089,694	1,248	\$51	296,275	\$22,187		\$7,452	\$154,895				\$421,336	\$120,890

TABLE OF MINERAL PRODUCTION OF BUTTE COUNTY—Continued.

Totals.	
Copper	\$2
Diamonds	725
Gold	24,089,694
Lead	51
Mineral water	22,187
Platinum	7,452
Silver	154,835
Stone industry	621,336
Unapportioned	120,860
Total (1880-1915, inclusive)	\$25,017,142

MINERALS AND MINES.

ASBESTOS.

Asbestos is reported to have been found near Blinzig, north of the big bend in the North Fork of Feather River, by J. C. Martin. The asbestos is of the amphibole variety and occurs in serpentine. The extent of the deposit has not been determined since no development work has been done.

Serpentine areas of considerable extent occur in the amphibolite and slate areas along a line drawn southeastward from Big Bar to Clipper Mills. Small veins of asbestos are in places found along fracture planes in the serpentine.

CHROMITE.

The demand for chrome during the last two years created considerable interest and old prospects which had lain idle for years were opened up and ore was shipped from some of the better ones.

The **Clipper Queen** prospect near Clipper Mills is owned by Geo. Woolley who has a 24-ft. prospect shaft on a chimney of chrome said to be from 2 ft.=8 ft. wide and 30 ft. long. Idle.

Curtis Bros. have developed a deposit of chrome near Pentz from which some ore is reported to have been shipped from Oroville and Durham in April, 1916. It has been operated by John Marchant of San Francisco.

Mr. N. Lambert of NimsheW is reported to have deposits of 48% chromé near Magalia in the SW. $\frac{1}{4}$ of Sec. 2, T. 22 N., R. 3 E., M. D. M. It is 4 miles from the Butte County Railroad. Two or three lenses of chrome are said to have been prospected but no ore has been shipped.

The **Zenith Mine** is in Sec. 6, T. 19 N., R. 7 E., M. D. M., about $2\frac{1}{2}$ miles northeast of Forbestown at an elevation of 2940 ft. Chrome occurs as kidneys in serpentine with talc. The ore was taken out by an open cut along an old shallow tunnel, and some was also grubbed

from the soil near the surface. Apparently most of the shipping ore was taken from a kidney from 6 ft.-20 ft. wide, 12 ft. deep and 75 ft. long, having a course N. 30° E.

The property was closed down when visited in September, 1916, but it was learned that 25 cars of ore were carried, by motor trucks, to Oroville and shipped to the United States Steel Corporation. Owned by the California Manganese Company and leased by E. A. Dickey and F. M. Driesbach of Oakland, under the name of Zenith Chrome Mining Company.

CRUSHED ROCK.

Crusher No. 2 of the **Natomas Consolidated of California** is operating at Oroville. It crushes cobbles from the old dredge tailings, converting them into rock suitable for building purposes.



Photo No. 1.—Rock crushing plant of the Natomas Consolidated of California at Oroville.
Capacity 1000 tons of crushed rock per day.

The dredge tailings are loaded into dump cars by a Bucyrus No. 40 steam shovel and hauled $1\frac{1}{2}$ miles to the crushing plant. The gravel is crushed and then screened to four sizes as follows: $2\frac{1}{2}$ "- $1\frac{1}{2}$ ", $1\frac{1}{2}$ "-1", $\frac{3}{4}$ "- $\frac{1}{2}$ ", $\frac{3}{8}$ " to dust. The crusher equipment consists of: One 18" x 36", one 24" x 36" and two 10" x 36" jaw crushers. Electricity is used for power.

The plant has a capacity of about 1000 tons of crushed rock per day and employs 23 men. The production of this plant is gradually being cut down, since the company's plant at Fair Oaks, Sacramento County, is large enough to supply the demand and is nearer to the market.

Owned and operated by the Natomas Consolidated of California, Rock Crushing Department, Forum Building, Sacramento; H. W. Thorne, manager, at Oroville.

DIAMONDS.

Diamonds have been found in the placer diggings at Thompson Flat two miles north of Oroville and in the old Cherokee hydraulic mine. The diamonds have been found mostly by "fossickers." In 1915 three white diamonds of first quality, weighing 1 carat each, and six small diamonds some of which were of gem quality, were found at Cherokee. In 1916 a diamond, which when cut was valued at \$125.00, was found in the old Cherokee mine by John Hufford, while another valued at \$52.00 was found by Ben Jutz.

GOLD—DREDGING.

Gold dredging in California was first carried on in the Oroville district, where W. P. Hammon and Warren Treat in 1898 sank test pits in the gravels. The results of their findings was brought to the attention of Thomas Couch, a Montana mining man, by Frank T. Southerland, and the Couch No. 1 dredge was built. Soon after this the Feather River Exploration Company was organized, the stock of which was held by Lewisohn Bros. of New York, Thos. Couch, W. P. Hammon and Frank T. Southerland.

Dredging in the Oroville field has been a great financial success. The greater part of the field has already been dredged and it is estimated that it will be worked out in about five years. At the end of the year 1916, eleven dredgers were being operated by the following seven companies, or parties:

Gardella	1
Kentucky Ranch	1
Natomas Consolidated	3
Oroville Dredging, Ltd.	2
Oro Water, Light and Power Company.....	1
Oroville Union	1
Pacific	2

The following table gives a condensed history of dredging in Butte County since its inception.

TABULAR HISTORY OF

Company	Dredge number	Type of construction	Year commissioned	Number and type of buckets	Bucket capacity, cubic feet	Rated capacity, horsepower
1898—W. P. Hammon and Thos. Couch.	Couch No. 1....	Risdon	Mar. 1, '98	-----	3	-----
	Couch No. 2....	Risdon	June 8, '00	-----	5	-----
	Couch No. 3....	Risdon	June 8, '00	-----	5	-----
1898—Feather River Exploration Co. Taken over in Jan., 1906, by the Feather River Development Co. and in Jan., 1909, by the Natomas Consolidated of Cal.	Feather R. No. 1	Couch No. 1.	Mar. 1, '98	-----	3	-----
	Feather R. No. 2	Couch No. 2.	June 8, '00	-----	5	63
	Feather R. No. 3	Couch No. 3.	June 8, '00	-----	5	63
	Feather R. No. 4	Risdon Couch No. 4.....	Dec. 10, '02	-----	5	63
	Feather R. No. 5	Risdon	Jan., 1903	-----	5	63
1899—Kia Oro Gold Dredging Co.	Kia Oro No.1....	Risdon	May, 1899	-----	3½	-----
1900—Marigold	No. 1.....	Risdon	Jan., 1900	-----	3	-----
	No. 2.....	Risdon	-----	-----	5	-----
1900—Lava Beds Dredging Co. Taken over by the Oro Water, Light and Power Co.	Lava Bed No. 1	-----	1900	-----	5	-----
	Lava Bed No. 2	West. Eng. Const. Bucyrus	July, 1903	Close conn.	5	208
	Lava Bed No. 3	West. Eng. Const. Bucyrus	Dec. 4, '04	Close conn.	5	203
	No. 1.....	Marion	Feb., 1901	-----	40	-----
1901—Oroville Gold Dredging Co.	No. 1.....	Marion	Feb., 1901	-----	40	-----
1901—Indiana Gold Dredging and Mining Company. Re-incorporated in 1907 as the Indiana Gold Dredging Co.	Indiana No. 1...	Company and Bucyrus	July 4, '01	79 close c.	3½	160
	Indiana No. 2...	West. Eng. Const. Co. Bucyrus machinery	Feb., 1903	80 close c.	4	150
	Indiana No. 3...	Bucyrus	Dec., 1907	Close conn.	4	150
	Indiana No. 4...	Bucyrus	-----	-----	-----	-----
1901—Boston and Oroville Mining Co. Taken over by the Oroville Dredging Ltd.	Boston No. 1...	Risdon	July, 1901	Close conn.	3	-----
	Boston No. 2...	Risdon	July, 1902	Close conn.	3	-----
	Continental	Bucyrus	1901	Close conn.	4	-----
	Boston No. 4...	Boston Machine Shop Marion	May, 1906	68 close c.	7	360
Garden Ranch Dredging Co...	-----	Marion machine	-----	Dippers.....	-----	-----
1902—Boston and California Dredging Co. Took over holdings of the Leggett & Wilcox Co. Taken over by Oroville Dredging Ltd.	Cal. or Leggett No. 1.....	Risdon	Mar., 1902	Close conn.	3½	-----
	Cal. or Leggett No. 2.....	West. Eng. Const. and Bucyrus	Dec., 1902	Close conn.	5	195
	Cal. No. 3.....	Boston Machine Shop and Marion	Oct., 1904	Close conn.	7	-----

BUTTE COUNTY DREDGERS.

Type of screens	Type and area of riffles	Dredge capacity, cu. yds. in 30 days. Based on actual operation	Depth dredged below water line, feet	Acres dredged	Total cu. yds. dredged, bank measurement	Total cost per cu. yd. in cts.	Remarks
Revolving	Cocoa matting	40,000				6.0	
Revolving	Cocoa matting	40,000				6.0	
Revolving	Cocoa matting	40,000				6.0	
Revolving	Cocoa matting	40,000				6.0	
		31,800	28			4.0	Wrecked by floods in 1907 and dismantled. Taken over by the Pacific Gold Dredging Co. Elevator dredge. Elevator dredge.
Shaking			36			8.0	
Shaking		20,000	40			8.0	
	528 square feet		35	48.82	2,645,330		Wrecked by flood March 17, 1907. Dismantled.
Shaking		21,000	36			7.5	Wrecked by flood March 17, 1907. Machinery used in construction of Indiana No. 3.
Shaking		21,000	36			7.5	Partly destroyed by floods of January 15, 1909. Reconstructed in July, 1909.
Revolving	Hungarian riffles	39,956	32			6.58	Put out of commission in 1908 because gravel became too tight to handle economically. First had 5 cu. ft. open link buckets.
Revolving	Hungarian riffles						First had 5 cu. ft. open link buckets. Put out of commission in 1908.
Shaking	Hungarian riffles						Worked out the property November, 1909. First built in 1899 with open link buckets.
Revolving		93,000	28				
		30,000					In Wyman Ravine District. Worked out property in 1909.
		39,415				6.23	First had 5 cu. ft. open link buckets. Sold to L. and J. Gardella.
Shaking	Hungarian riffles	60,000	36				
Revolving	894 square feet	92,000					Dredged its way to the Viloro property in 1909. Formerly had 4 cu. ft. open link buckets.

TABULAR HISTORY OF BUTTE

Company	Dredge number	Type of construction	Year commissioned	Number and type of buckets	Bucket capacity, cubic feet	Halted capacity, horsepower
1902—Oroville Gold Dredging and Exploration Co. Taken over by the Oroville Dredging Ltd.	Exploration or Biggs No. 1.	Risdon	April, 1902	78 close c.	3	-----
	Exploration or Biggs No. 2.	West. Eng. Const. and Bucyrus	1905	Close conn.	5	238
	Explor. No. 3.	Boston Machine Shop and Marion	Oct. 20, '06	Close conn.	7	-----
1902—Gardella, L.	Gardella or Honcut	Risdon	May 1, '02	28 open link	5	165
Gardella, L. and J.	Gardella	Risdon	Oct. 12, '07	Open link	5 ¹	-----
1902—Cherokee Gold Dredging Co.	Cherokee No. 1.	Bucyrus	Oct., 1902	Close conn.	5	120
1902—American Gold Dredging Co. Taken over by Pacific Gold Dredging Co.	American No. 1.	Bucyrus	Nov., 1902	-----	3	-----
1902—Pennsylvania Dredging Co.	American No. 2.	Bucyrus	-----	-----	5	100
	Pennsylvania	Golden State Miners Iron Works, S. F.	Nov. 1, '02	54 close c.	6	220
1902—Butte Gold Dredging Co.	Butte No. 1.	West. Eng. and Const. Co. Bucyrus	Nov. 26, '02	90 close c.	3 ¹	165
1903—El Oro	El Oro No. 1.	Link Belt Machinery Co., Chicago	Dec. 26, '03	80 close c.	5	290
	El Oro No. 2.	Link Belt Machinery Co.	Jan. 22, '08	Close conn.	5	390
1904—Leggett (Jas. H.) Gold Dredging Co. Later—Leggett Gold Mining Co.	Leggett No. 3.	Risdon	Mar. 31, '04	35 open link	5	175
	Leggett No. 4.	Risdon	Sept., 1909	Open link	5	-----
1904—Central Gold Dredging Co.	Central No. 1.	West. Eng. Const. and Bucyrus	May, 1904	-----	3	-----
1904—Ophir Gold Dredging Co. Consolidated with the Central or Nevada Gold Dredging Co.	Nevada	Central No. 1	May 15, '04	92 close c.	4	168
	Ophir	West. Eng. Const. and Bucyrus	Aug. 4, '06	77 close c.	5	262 ¹
1904—Viloro Syndicate Ltd.	Viloro No. 1.	West. Eng. Const. and Bucyrus	Oct. 30, '04	72 close c.	5	242 ¹
	Viloro No. 2 or Cal. No. 3.	Marion	Oct. 30, '04	-----	7	-----

*Record in April, 1908.

¹Average in 1908.²Capacity said to be 75,000 cubic yards.³Average for 5¹/₂ years.⁴Average in 1908.⁵Acres monthly.⁶3,500,000 cubic yards to January 1, 1909.

COUNTY DREDGERS—Continued.

Type of screens	Type and area of riffles	Dredge capacity, cu. yds. in 30 days. Based on actual operation	Depth dredged below water line, feet	Acres dredged	Total cu. yds. dredged, bank measurement	Total cost per cu. yd. in clas.	Remarks
Revolving							
End shak'g	Hungarian riffles	*109,630	30				
		90,000	35.5				
Revolving	Risdon return sluices, 350 sq. ft.		10			¹³	Dismantled in August, 1909, and moved to Honcut Creek, where it began dredging in February, 1910. Formerly California No. 1 dredge.
							In Wyman's Ravine.
						7.0	Taken over in 1909 by the Natomas Consolidated.
		60,000				3.0	Taken over by the Pacific Gold Dredging Co.
		90,000				3.0	
Two shak-ing scns.	800 square feet	43,880	28		⁸	8.5	
Endshak'g	750 square feet	47,640	38	40	⁹	7.0	Dismantled in July, 1910.
Endshak'g	420.7 square feet	¹⁴ 5,590	30	34	¹⁰		
Shaking		² 75,000	30	34	¹⁰		
Revolving	Longitudinal angle irons and cobbles	³ 68,166	30	71.13	¹¹	5.0	Worked out the property and dismantled in June, 1909.
			10			¹⁴	In Wyman's Ravine. Leggett No. 3 r. constructed.
		40,000	30				Reincorporated as the Nevada Gold Dredging Co.
Revolving	Hungarian	⁴ 44,334	36				Ophir and Nevada Gold Dredging Co., Consolidated.
Shaking	832 square feet	⁴ 44,334	36		¹²		
Shaking	Hungarian 1,000 square feet		36				Viloro No. 1 destroyed by fire October 18, 1909.
Revolving							Purchased from California Oroville Dredging Ltd.

²2,665,000 cubic yards to January 1, 1909.¹⁰1,655,000 cubic yards to January 1, 1909.¹¹4,500,000 cubic yards to January 1, 1909.¹²1,800,000 cubic yards during first three years.¹³Gravel said to average 16 cents per cu. yd.¹⁴Gravel said to average 15 cents per cu. yd.

TABULAR HISTORY OF BUTTE

Company	Dredge number	Type of construction	Year commissioned	Number and type of buckets	Bucket capacity, cubic feet	Rated capacity, horsepower
1906—Oro Water, Light and Power Co. Took over the Lava Bed Dredging Co. and the Marigold Gold Dredging Co.	Lava Bed No. 2	West. Eng. Const. and Bucyrus	July, 1903	Close conn.	5	208
	Lava Bed No. 3	West. Eng. Const. and Bucyrus	Dec. 4, '04	Close conn.	5	203
	Empire	West. Eng. Const. and Bucyrus	April 22, '06	82 close c.	5	225
	Victor	West. Eng. Const. and Bucyrus	Sept. 4, '07	Close conn.	5	225
	Hunter	West. Eng. Const. and Bucyrus	Aug. 13, '07	82 close c.	5	225
	Pacific or Perry No. 1	West. Eng. Const. and Bucyrus	May 1, '06	84 close c.	7½	300
1906—Pacific Gold Dredging Co. A subsidiary of the Yukon Gold Dredging Co. Took over the American Gold Dredging Co. and the Kia Oro Gold Dredging Co.	Pacific or American No. 1		Oct., 1902	Close conn.	4	
	Pacific or American No. 2	West. Eng. Const. and Bucyrus	April, 1904	Close conn.	5	208
	Pacific No. 4	West. Eng. Const. and Bucyrus	Jan. 26, '08	80 close c.	7	300
	Baggett No. 1	Risdon Iron Works	May 26, '06	37 open link	7	215
1906—Oroville Dredging Limited. Took over the Boston and California, Boston and Oroville, Oroville Gold Dredging and Exploration Co.	California No. 2		Jan. 1, '03	Close conn.	5	
	California No. 3		Oct., 1904	Close conn.	7	
	Explor. No. 1		April, 1902	Open link	3	
	Explor. No. 2		Feb. 17, '05	Close conn.	5	
	Explor. No. 3		Oct. 20, '06	Close conn.	7	
	Boston No. 4		May 2, '06	Close conn.	7	
1909—Natomas Consolidated of California. (Feather River Division.) Took over the Cherokee and Feather River Exploration Cos. on January 1, 1909.	Continental		June, 1899	Close conn.	4	
	Cherokee or Feather No. 1	Bucyrus	July, 1902	Close conn.	5	205
	Feather No. 1 (formerly Feather No. 2)	Yuba Const. Co. Marion	Dec. 22, '06	68 close c.	7½	460
	Feather No. 2 (formerly Feather No. 3)	Yuba Const. Co. Marion	Mar. 26, '08	80 close c.	7½	460
	Feather No. 3	Yuba Const.	Sept. 10, '11	79 close c.	15	735
1909—Kentucky Ranch Gold Dredging Co. 1909—Butte Creek Cons. Dredging Co.	Feather No. 4	Risdon Feather R. No. 4	Mar. 10, '02	Open link	3½	
	Kentucky No. 1	Risdon	May 1, '09	32 open link	5	175
	Butte Creek	Ed L. Smith design and Taylor Iron and Steel Co. machinery	May 1, '09	39 open link	11	375

⁶Acres per month.⁶Built for 36 feet; average 28 feet.¹⁵1,500,000 cubic yards to January, 1910.¹⁰Gravel averages 9 cents per cubic yard.¹⁷Average of all dredges 5.34 cents during the year July, 1906, to July, 1907.

COUNTY DREDGERS—Continued.

Type of screens	Type and area of riffles	Dredge capacity, cu. yds. in 30 days. Based on actual operation	Depth dredged below water line, feet	Acres dredged	Total cu. yds. dredged by bank measurement	Total cost per cu. yd. in cts.	Remarks
Shaking			36				
Shaking			40				
Revolving	Holmes		38				Leak in hull and turned over in pond, 1909.
Revolving			38				
Revolving			38				
Engshak'g	Holmes	117,205	34½	52	16	4.44	
						16	
	Holmes		36			16	
Endshak'g		11,000	29			165.0	
Revolving	300		35 av. 30	28	16	17	Gravel averages 12½ cents per cubic yard. Gross output per cubic yard in 1906-1907 was 11.23 cents.
							Worked out the property and closed down November, 1909.
Shaking	Hungarian		45				Formerly the Cherokee dredge. Closed down December 31, 1909.
Revolving			25-40	18246	9,766,000	4.41	Gravels average from 9 cents to 14 cents per cubic yard.
Revolving			25-40	18210	10,560,000	3.69	Gravels average from 9 cents to 14 cents per cubic yard.
Revolving			40	18246	13,714,000	3.60	Gravels average from 9 cents to 14 cents per cubic yard.
				1810	18,445,000	7.64	Gravels average from 9 cents to 14 cents per cubic yard. Closed down December 31, 1909.
Revolving	Risdon double return 264 sq. ft.		18			20	On Honcut Creek.
Revolving	Manganese steel riffles 624 sq. ft.	30,000	37	214			Sold to Trinity Star Gold Dredging Co. in 1916.

¹⁸To June 30, 1916.¹⁹To 1910.

13-46904

²⁰Gravel said to aver. 11 to 12 cents per cu. yd.²¹Acres per month.

The **Butte Creek Consolidated** dredge was located on Butte Creek in 1916. It originally had 39-11 cu.-ft. open-link buckets with a capacity of 30,000 cu. yds. of gravel per month. It was sold to the Trinity Star Gold Dredging Company, who dismantled it in 1916 for shipment to Lewiston, Trinity County. C. E. Mason, superintendent, Chico.

The **Honcut** dredge, operating on Honcut Creek, is owned by Lawrence Gardella of Oroville. It is a Risdon dredge with 5 cubic-foot buckets, revolving screen, pumps and 50-ft. bucket elevator run



Photo No. 2.—Honcut dredge on Honcut Creek, southeast of Oroville, Butte County.

by electric motors. Power is taken from the line of the Oro Light and Power Company. The dredge is provided with about 600 sq. ft. of riffles. When visited in December, 1916, it was expected to finish the ground in about three months after which the dredge was to be dismantled and moved to Trinity County.

The **Hunter** dredge is operating on the east side of Feather River below Oroville. It is a Bucyrus dredge with 76-6 cu.-ft. close-connected buckets which will dig 37 feet below the water line. Nine men were employed in 3 shifts of 8 hours each. When visited in December, 1916, the dredger was digging from 26'-30' below the water line and handling from 163 to 200 cu. yds. per hour. Owned by the Oro Water, Light and Power Company of Oroville; C. G. Leeson, manager.



Photo No. 3.—Hunter dredge of the Oro Water, Light and Power Company, on the east side of the Feather River below Oroville.

The **Kentucky Ranch** dredge is operating on Honcut Creek in Sec. 18, T. 18 N., R. 5 E., M. D. M., 10 miles southeast of Palermo. It is a Risdon dredge equipped with 54-5 cu.-ft. close-connected buckets, revolving screen, conveyor belt stacker, and head lines. The winch room is on the main deck. The ground is difficult to work on account of large boulders. The dredge is getting old and it is expected to work only until it goes to pieces. Owned by the Kentucky Ranch Gold Dredging Company, Lawrence Gardella, manager; D. P. Roderic, dredgemaster, Oroville.



Photo No. 4.—Kentucky Ranch dredge on Honcut Creek, southeast of Oroville.

The **Natomas Consolidated** of California has three dredges on the Feather River southwest of Oroville. Two of these have $7\frac{1}{2}$ cu.-ft. close-connected buckets, while a third has 15 cu.-ft. buckets. Electricity is obtained from the Pacific Gas and Electric Company.

The depth to bedrock is about 40 ft., the pay gravel being covered with hydraulic tailings. The bedrock is soft and the dredgers dig into it about 18 inches. Natomas Consolidated of California, Forum Building, Sacramento. Emery Oliver, general manager.



Photo No. 5.—Natoma No. 3 dredge on the east side of Feather River below Oroville.

The **Oroville Dredging Limited** is operating two dredgers near Thermalito on the west side of Feather River. Boston No. 4 dredge has $65-7\frac{3}{4}$ cu.-ft. buckets with a capacity of 120,000 cu. yds. per month. It is of the Marion winch type good for 32 ft. below the water line, and has 400 sq. ft. of riffles. When visited it was digging to a depth of 25 ft. and was operated by three 8-hour shifts of 3 men each. Exploration No. 3 dredge is the same size as Boston No. 4 but has a crown deck 4 ft. wider, and a Bucyrus winch. Owned by the Oroville Dredging, Ltd., James Osgood, manager, San Francisco. Geo. Featherston, superintendent, Oroville.

The **Oroville Union Gold Dredging Company** is a combination of the old Oroville and Pennsylvania companies. It holds 40 acres of land on the west side of Feather River south of Oroville and is operating the old California No. 3 dredge. The dredge has been in commission for over 14 years and now handles about 75,000 cu. yds. of

gravel per month. The gravels average over 11¢ per cu. yd. and it costs less than 4½¢ per cu. yd. to handle it. W. H. James, president; J. G. Nisbet, manager, Oroville.



Photo No. 6.—Boston No. 4 dredge, of the Oroville Dredging Company, operating on the west side of Feather River below Oroville.

The **Pacific Gold Dredging Company** has two Bucyrus dredgers in the county. Pacific No. 3 has been operating in Sec. 3, T. 21 N., R. 2 E., on Big Butte Creek, for about two years. The channel is about ¼ mile wide and 20 ft. deep. The dredge is equipped with 6 cu.-ft. buckets and shaker screen and has a capacity of about 120,000 cu. yds. per month. It is expected that the ground will be worked out in another year.



Photo No. 7.—Pacific No. 3 dredge on Big Butte Creek, eight miles east of Chico.

Pacific No. 4 is operating on the west side of Feather River southwest of Oroville. It is equipped with 78-7 cu.-ft. close-connected buckets and shaker screen and handles about 4500 cu. yds. of gravel per day. When visited in December, 1916, it was digging through tailings in order to reach a new piece of ground. O. C. Perry, manager, Oroville.



Photo No. 8.—Pacific No. 4 dredge on the west side of Feather River, southwest of Oroville.

GOLD—DRIFT MINES.

Drift mining in Butte County has been more active during the last year. Several properties were being opened up when visited but few were as yet on a producing basis.

The **Bader Gold Mining Company** has started to open up a channel $1\frac{1}{2}$ miles southwest of Magalia in Sec. 1, T. 22 N., R. 3 E., M. D. M. A new 150-ft. tunnel has been run N. 75° E. at an elevation of 1900 ft., and a 70-ft. raise run north to strike the gravel.

The property has been worked off and on for the last 25 years. It was hydraulicked until the soft shale of the west rim began to slide, after which a 1000 ft. tunnel was driven. Attempts to drift met with failure on account of slides. The new work has been carried on along the west rim in porphyry and slate bedrock.

The gravel consists of granite wash and the gold found in it is said to have been oxidized but coarse, with grains about the size of cucumber seeds. Geo. B. Mowry, superintendent, Magalia.

Bibl.: Rept. XIII, p. 82, 1895-6.

The **Bader Bros.** drift property is in the E. $\frac{1}{2}$ of Sec. 36, T. 23 N., R. 3 E., M. D. M., $\frac{1}{2}$ mile southwest of Magalia. A 1000-ft. tunnel in slate is said to have crossed a channel which is said to be 30 ft. wide. Idle. Owned by H. F. Bader of Magalia.

The **Bay State** mine is reported to be $1\frac{1}{4}$ miles southwest of Nimshew on the east side of Big Butte Creek. Elevation 2000 ft.; 100 A.; channel course NE.-SW.. A 300-ft. tunnel in slate and 200-ft. tunnel in granite. Gravel free. Idle.

Bibl.: Rept. VIII, p. 117, 1888.

The **Bangor** drift mine is reported to be 1 mile east of Bangor. A 2400-ft. channel. Idle.

Bibl.: Repts. XI, p. 164, 1892; XII, p. 80, 1894; XIII, p. 82, 1896.

The **Burgstrasser** or **Kickapoo** drift mine is 6 miles west of Strawberry Valley, elevation 3500 ft.; 100 A.; 300-ft. bedrock tunnel, 12 ft. raise; 300 ft. gangway, 6 ft. of gravel, no breasting. Idle.

Bibl.: Rept. XIII, p. 83, 1895-6.

The **Bushness** drift mine is reported to be located on Blackhawk Creek. Development work is reported to consist of sinking and drifting on a gravel channel. Leased by Messrs. Poug, Hughes and Hogan of Oroville.

The **Butte Belle** drift mine is $2\frac{1}{2}$ miles southwest of Lovelock in Sec. 3, T. 23 N., R. 3 E., M. D. M. It includes 159 A. in the Butte Mining District. Development consists of a bedrock tunnel in serpentine run 550 ft. to intersect a channel N. 10° W. along Big Butte Creek. A well-defined gold-bearing vein crosses the property. Idle.

Bibl.: Rept. XII, p. 81, 1894.

The **Butte King** mine adjoining, was abandoned in 1894. The Brown Ravine mine adjoining, with 160 A. had a 105-ft. bedrock tunnel in granite with an 8-ft shaft, but these were abandoned on account of water. A lower 260-ft. tunnel was being run in 1890. Idle. Owned by Graham and Braden of Stirling.

Bibl.: Rept. X, p. 146, 1890; XII, p. 81, 1894; XIII, p. 83, 1895-6.

The **Butte Queen** drift mine in Sec. 20, T. 25 N., R. 5 E., M. D. M., is 4 miles west of Philbrook, at an elevation of 6225 ft. Coarse gold is reported to have been taken from a tunnel which encountered 5 ft. of gravel under a 150-ft. lava cap. The bedrock is granite and schist.

The **Carr** prospect is 1 mile northeast of Philbrook in the SE. $\frac{1}{4}$ of Sec. 7, T. 25 N., R. 5 E., M. D. M. A new 60-ft. incline shaft was reported as being run by 5 men who expected to strike gravel at

150 ft. Owned by Mr. Stone of San Francisco; J. B. Carr, superintendent.

The **Catskill** drift property lies 1 mile northwest of Bangor. Elevation 750 ft.; 800 A. It is reported that a channel running E.-W. had 12'-14' of gravel on the bedrock which ran \$2.50 per cu. yd. Sand and gravel from 3' to 6' thick overlie the gravel. Development work consists of a 210-ft. double compartment shaft with the main gangway 900' E. and 300' W. Breasting has been carried on from 8' to 18' high and 40' wide. An 85 h.p. engine ran a 6" jackhead pump, hoist and two 10-ft. arrastras. Water was obtained from the Forbestown ditch. Idle.

Bibl.: Rept. XII, p. 82, 1894; XIII, p. 84, 1895-6.

The **Cole** or **Butte Star** drift mine is $1\frac{1}{2}$ miles west of NimsheW in Sec. 22, T. 23 N., R. 3 E. Elevation 2470 ft. A channel capped with lava is reported to run N. 10° E. A 606-ft bedrock tunnel in slate has been run and the gravel channel followed for 2400 ft. Water was obtained from Centerville. Idle.

Bibl.: Rept. X, p. 144, 1890.

The **Contention** drift mine is reported to be $\frac{3}{4}$ mile southwest of Lovelock in Sec. 36, T. 23 N., R. 3 E., M. D. M. Elevation 2800 ft.; 60 A. A lava-capped channel 30 ft. wide runs E.-W. and is opened up by a 190-ft. bedrock tunnel which continues 65 ft. across the channel. The gravel is reported to be 4 ft. deep along 30 ft. of the tunnel and to have yielded coarse gold. The channel has been followed down stream. Water was obtained from Little Butte Creek. Idle.

Bibl.: Rept. XIII, p. 84, 1895-6.

The **Dog Hill** drift mine is $1\frac{1}{2}$ miles west of Chaparral. Elevation 5800 ft.; 80 A. A 200 ft. channel is reported to have a NE.-SW. course and to have a 150-ft. capping of lava. Two tunnels have been run but are said to have been too high. A third tunnel was run in bedrock. Idle.

Bibl.: Rept. XII, p. 82, 1894; XIII, p. 84, 1895-6.

The **Emma** drift mine is reported to be near NimsheW. A tunnel was driven by the NimsheW Gold Mining Company, but the channel was lost and thought to have been faulted. The property was leased to A. H. Rugh who is reported to have taken out a nugget valued at \$726 in November, 1915.

The **Feather River** or **Blue Hog** mine near Magalia has been worked intermittently ever since 1882. Coarse, rounded gold was taken from a channel which had 50 ft. of gravel capped with lava, through an 800-ft. bedrock tunnel in serpentine. A cresscut was made at the

south end of the old workings in 1916 by 4 men superintended by E. F. Woodworth. The channel exposed is said to be 100 ft. wide. Owned by J. A. Fairchild, W. R. Rowland and J. Coin of Los Angeles, who compose the Feather River Land and Mining Company.

The **Gold Hill** mine on the west branch of Feather River about 3 miles from Magalia is reported to have been reopened by Oakland parties who held an option from M. A. Glover. The leasing company consists of H. C. Hanson, G. H. Bibb, J. W. Thatcher and Henry M. Thatcher.

The **Golden Summit Blue Gravel** mine is reported to be 7 miles east of Inskip at an elevation of 6300 ft.; 159 A. The channel course is SW. and carries coarse gold. Development work consists of a 900-ft. tunnel.

Bibl.: Rept. XIII, p. 86, 1895-6.

The **Gregory** property is 9 miles east of Chaparral on the same channel as the Butte King and Butte Queen mines to the south. Five feet of lava-capped gravel is reported to be opened up by a 530-ft. tunnel, 12 ft. shaft on the pitch of the rimrock and a 200 ft. drift across the channel.

Bibl.: Rept. XII, p. 84, 1894.

The **Index** or **Wylie** drift mine is in Sec. 3, T. 22 N., R. 3 E., M. D. M., $3\frac{1}{2}$ miles southeast of Nimshew on Middle Butte Creek; 380 A. Elevation 1250 ft. The channel courses NE. and carries from 3'-4' of blue gravel on bedrock of slate and serpentine. Old workings in 1890 consisted of a 300-ft. main tunnel with branches of 40', 60' and 35'; also 80' of drifts. Development in 1895 consisted of a 300-ft. incline and a 100-ft. bedrock tunnel. Water was obtainable for 9 months of the year from Middle Butte Creek.

Bibl.: Rept. X, p. 138, 1890; XIII, p. 86, 1895-6.

The **Irwin** mine is $\frac{1}{2}$ mile northeast of Centerville at an elevation of 500 ft. and includes a 240 acre patent. A channel $\frac{3}{4}$ mile long is said to have a course NE.-SW. Gravels are said to be exposed 700 ft. deep and overlain by 700 ft. of lava. Two tunnels are said to have been run 200 ft. and 240 ft. long. The Pacific Gas & Electric Company ditch passes within $\frac{1}{2}$ mile of the property. Idle for 20 years. Owned by T. R. Bennington, of Halleek, San Bernardino County; A. C. Smith, of Portland, Oregon, and J. M. Irwin, of Chico, c/o De Sabla stage.

The **John Dix** mine is 6 miles northwest of Lovelock on the North Fork of Big Butte Creek at an elevation of 2000 ft. The property is reported to have had 200 acres, on the Portuguese Point Channel, developed by a 2800-ft. incline. In 1895 about 2800 ft. of channel had been

worked through an incline and the gravel breasted out 300 ft. wide and from 4' to 5' high. The course of the channel is NE.-SW. A hoist was run by 400 inches of water from the west branch of Butte Creek. The gold was caught in 200 ft. of 18" flume lined with slat riffles. Idle.

Bibl.: Rept. XII, p. 85; XIII, p. 87.

John's prospect is in Sec. 7, T. 25 N., R. 5 E., M. D. M., near Stirling. Coarse gold occurs in a gravel channel which is being opened up by Mr. Johns of Stirling.

Jones Brothers and **Reese** mine is reported to be 10 miles east of Chaparral House in Sec. 29, T. 25 N., R. 5 E., M. D. M. It was thought to be a southerly extension of the Butte King and Butte Queen mines. Where the channel breaks out the bedrock is slate and has an elevation of 6140 ft. A 450-ft. tunnel in gravel near the west rim connects with an old tunnel on the east rim by a crosseut drift. In 1894 the gravel was washed in 120 ft. of riffled flume with water from the tunnel.

Bibl.: Rept. XII, p. 85, 1894.

The **Kelly Hill** prospect is in the W. $\frac{1}{2}$ of Sec. 27 and SE. $\frac{1}{4}$ of Sec. 28 of T. 23 N., R. 3 E., M. D. M., 2 miles southeast of Nimshew. It includes a 430-acre patent and a 1.4 acre claim. A channel coursing NE.-SW. carries coarse gold. The gravel is said to be 176 ft. deep and capped with 700 ft. of lava. Four bedrock tunnels have been run 700', 600', 500' and 250' long and the gravel in places is said to have paid well. In the 250-ft. tunnel the gravel prospects but a channel has not been encountered. Owned by Eugene J. de Sabla of Burlingame, Anna Pierson of San Francisco and A. C. Hanson of Chico, c/o de Sabla stage.

The **Kidd** mine near Nimshew has been opened up during the last year by 4 men who ran a tunnel in slate. The bedrock pitched off and the owners think they were on a bar and have now found the main channel. Owned by Nimshew Exploration Company, consisting of Fred Walker et al., of Nimshew. Geo. Slimer, superintendent.

The **Kirby** or **Indian Springs** mine is in the SE. $\frac{1}{4}$ of the NE. $\frac{1}{4}$ and the SE. $\frac{1}{4}$ of Sec. 34, T. 24 N., R. 3 E., M. D. M., $1\frac{1}{2}$ miles northwest of Hupps. Elevation 2400 ft. The holdings include 6 claims of which 5 are patented. The channel is said to run NE.-SW. and to carry smooth, coarse-wash gold. An old shaft was sunk 150 ft. deep but after about 40 ft. of drifting was done, it caved and was lost. A new shaft 103 ft. deep was being sunk 90 ft. north of the old one and it was expected to strike the channel at 160 ft. in depth. About 100 gallons of water per minute were encountered and it was being handled by 1 centrifugal and 1 jackhead pump. Sawed timber was being

used which cost \$24.00 per M. delivered at the mine. Electricity is secured from the Pacific Gas and Electric Company by a 2-mile line owned by the Kirbys. Owned by G. W. Kirby of De Sabla. Option held by E. S. Armstrong, et al., of Los Angeles. N. Touroff, superintendent.

The **Lucky John** mine in Sec. 11, T. 22 N., R. 3 E., M. D. M., is 2 miles north of Paradise and adjoins the Mineral Slide mine to the east. Some 1100 ft. of the old tunnel has been opened up and a 100 ft. incline raise retimbered to reach the gravel. About 320 ft. of tunnel have been run along the lower gravel which is being washed.

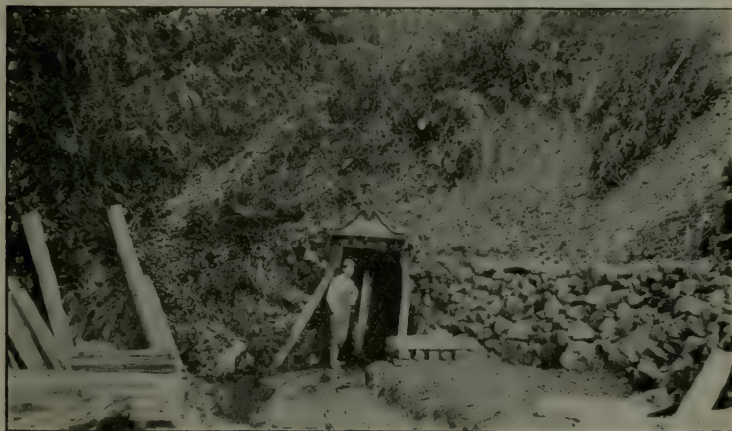


Photo No. 9.—Tunnel entrance to Lucky John drift mine near Paradise.

The pay gravel of the channel has not yet been reached. Three men were employed by John D. Hubbard of Paradise, superintendent and part owner. Owned by Jno. D. Hubbard and Jas. Spears, Mills Building, San Francisco, and P. J. Dunn of San Jose.

The **Lynch** and **Brown** prospect is on unsurveyed land 2 miles east of Inskip at the junction of Fish Creek and Brown's Ravine. Gravel is being taken from a 180-ft. incline shaft. Owned by Lynch and Brown of Inskip.

The **Magalia**, **Perschbaker** or **Lucretia** drift mine is on Little Butte Creek, 3 miles northeast of Magalia at an elevation of 2800 ft. The channel was worked through a 502-ft. perpendicular shaft to bedrock which had a grade of 12' in 100'. The channel from 4'-20' wide was supposed to be a branch of the deep channel under Magalia Ridge. The channel was worked out.

Bibl.: Repts. XII, p. 87, 1894; XIII, p. 89, 1895-6.

The **Mesilla Valley Blue Gravel** or **Welch** mine is 1 mile north of Pentz at an elevation of 1020 ft. The property includes 240 acres and is reported to include a blue-gravel channel 25 ft. deep capped with lava. A 200-ft. bedrock tunnel in slate was run and a 400-ft. gangway up the channel had been completed in 1895. Water was obtained from the Miocene ditch. Idle.

Bibl.: Rept. XIII, p. 89, 1895-6.

The **Mineral Slide** mine is 3 miles southwest of Magalia in Sees. 3 and 10, T. 22 N., R. 3 E., M. D. M., at an elevation of 1000 ft. The property includes a 390 A. patent and a water right on Butte Creek located in 1881. Coarse gold is reported to occur in a channel 4'-8' deep, $\frac{1}{2}$ mile wide and 1 mile long and to be capped with from 700'-900' of lava. The concentrate is said to carry $2\frac{1}{2}\%$ platinum.

The channel was first worked through an incline and later through a drain tunnel. A new drain tunnel, to be 1500 ft. long when completed, was in 1200 ft. when visited. This new tunnel is driven by blasting and washing the rock from the face of the tunnel with water from a 12" wood stave pipe reduced to 6". When gravel is reached it is planned to install electrically driven buckets to carry the gravel to the tunnel sluice boxes from which it will be washed out into a revolving screen and through more sluice boxes.

Six men were employed in driving the tunnel by S. P. Moody, superintendent. Owned by G. M. Gooday ($\frac{1}{4}$), L. Cohn ($\frac{1}{4}$) and S. P. Moody ($\frac{1}{2}$), composing the Mineral Slide Gold Mining Company. G. M. Gooday, president, Magalia. Leased to C. H. Hand and J. F. Cowen of Salt Lake.

The **Monitor** mine is on the south fork of Feather River. It is reported that a shaft is being sunk to the bottom of a gravel deposit. Equipment consists of a 20 h. p. boiler, steam pump and hoist.

The **Morris Ravine** or **Butterfly** mining property includes a 1200-acre patent in Morris Ravine 3 miles northeast of Oroville. The mine was abandoned in 1909 after the Goodall Company had run a 1400-ft. tunnel into the side of the hill. New development work consists of a 500-ft. tunnel run N. 20° E. and 500 ft. of drifts. Work was being carried on, in December, drifting and crosscutting looking for gravel.

The tunnel has been run in slide material brought down by undercutting Table Mountain by hydraulicking in the early days. The face of the tunnel is only a short distance beyond the plane of slipping and is 7 ft. above the bedrock in soft white-sands of the Ione formation. The white sands carry no value but gravels on the bedrock carry rough rusty gold.

Owned by the Goodall Estate Company, San Francisco. Leased by the Morris Ravine Leasing Company, W. T. Baldwin, president; R. S. Kitrick, secretary; C. L. Bills, treasurer; and H. W. Te Grunde, manager, Oroville.

The **Napa and Solano Counties Company** or **Best** mine is reported to be 3 miles west of Lovelock in Sec. 27, T. 24 N., R. 3 E., M. D. M., at an elevation of 2100 ft. The property includes 40 acres which is



Photo No. 10.—Tunnel of the Morris Ravine Leasing Company near Table Mountain, four miles north of Oroville.

reported to have a channel running NE.-SW. Development consists of a 650-ft. bedrock tunnel in slate and serpentine and a 30-ft. raise. Breasting has been carried on from 50'-100' wide, 5'-6' deep and 600' long. Water was obtained from the mine. Idle.

Bibl.: Rept. XIII, pp. 82-89, 1895-6.

The **Nimshew** or **Pewperingtuno** mine is $\frac{1}{2}$ mile west of Nimshew at an elevation of 1625 ft. It includes 400 acres on which five channels are reported. These are said to be, from 10'-40' wide, 2' deep with a general course of N. 47° E. In 1895-6 three tunnels had been run 1300', 1600' and 1100' long. Idle.

Bibl.: Rept. XIII, p. 89, 1895-6.

The **Old Glory** mine in Morris Ravine, 3 miles northeast of Oroville, includes 60 acres. Development work in December, 1916, consisted of a 400-ft. tunnel run west at an incline of 30°. It is expected to strike the main pay channel at about 600 ft. but it is planned to extend the tunnel to 1000 ft. in length, under South Table Mountain.

The tunnel is being driven by hand drilling. A 4-ft. undershot wheel runs the hoist and a No. 3 air blower. The gravel is dumped into a bin and washed through 250 ft. of sluice boxes by water from the water wheel. Water is obtained from Morris Ravine. Owned by Richard Phillips of Oroville.

The **Palace** mine is 2 miles west of Lovelocks at an elevation of 2100 feet. The property includes 260 acres on which a lava capped channel is reported to have a NE.-SW. course. The gravels are



Photo No. 11.—Gravel bin and dump, showing new work being carried on just south of the Old Glory mine in Morris Ravine near the base of South Table Mountain.

reached by a 300-ft. bedrock tunnel in slate and are from 2'-4' deep and 80' wide. In 1895 a 1250-ft. gangway followed up the channel of which 800 ft. was breasted. The gravel was washed through the tunnel with water from Cherokee ditch. Idle.

Bibl.: Repts. XII, p. 87, 1894; XIII, p. 90, 1895-6.

The **Parry** or **Alki** mine is 4 miles northeast of Magalia at an elevation of 1700 ft. The property is reported as consisting of 320 acres with a 12-mile water ditch from the west branch of Feather River. A 30-foot overshot wheel ran 4 pumps since the gravels were worked through a 1000 ft. incline shaft. Idle.

Bibl.: Rept. XIII, p. 82, 1895-6.

The **Porphyry Point** mine is reported $3\frac{1}{2}$ miles north of Magalia including 30 acres. A channel is thought to run NE.-SW. Development work consists of a 75-ft. bedrock tunnel in porphyry and a 90-ft. incline shaft. Idle.

Bibl.: Rept. XII, p. 88, 1894; XIII, p. 91, 1895-6.

The **Princess, Aurora, or Church** property consists of 320 A., $2\frac{1}{2}$ miles northeast of Magalia at an elevation of 2400 ft. A channel coursing N. 30° E. is reported to be 70 ft. wide with 3 ft. of blue gravel opened up by a 330-ft. incline shaft. The bedrock is serpentine.

Bibl.: Rept. XIII, pp. 82, 91, 1895-6.

The **Republican** mine is reported as 4 miles northwest of Lovelocks at the forks of Butte Creek. A channel coursing south of east has a bedrock of slate and granite. Worked through a 400-ft. tunnel with 160 ft. of sluices lined with hungarian and slat riffles. Idle.

Bibl.: Rept. XII, p. 88, 1894.

The **Robbers' Roost or Oro Fino** mine is in Sec. 10, T. 23 N., R. 3 E., M. D. M., 2 miles north of Nimshew at an elevation of 2100 ft. The property includes 270 A. on which a channel courses NW.-SE. Development consists of a 2700-ft. bedrock tunnel in slate run due south with a crosscut run east which struck another channel. The width of the main channel is from 25' to 140' and it has been breasted 40 ft. wide. The gravel was run through sluice boxes. New work on the Robbers' Roost was carried on just south of the old Oro Fino for a few weeks during the fall of 1916, but this ceased in October. Owned by Mr. Scribner of San Francisco. W. F. Anderson, superintendent, Nimshew or 302 El Nido Apts., Oakland.

Bibl.: Repts. XI, p. 160, 1892; XII, p. 86, 1894; XIII, p. 89, 1895-6.

The **Royal Drift Mining Company** is reported to have several claims on the west branch of Butte Creek among which are the Straughn Channel, Royal Drift and Clarke. J. H. Durst of Wheatland interested. Allan Veatch, engineer.

The **South Fillbrook** property is reported in Sec. 20, T. 25 N., R. 5 E., M. D. M., at an elevation of 6000 ft. In 1890 a 180-ft. bedrock tunnel was being run SE., in granite and conglomerate, to strike a gravel channel. Idle.

Bibl.: Rept. X, p. 146, 1890.

The **Steifer or P. B. Steifer** mine in Sec. 13, T. 23 N., R. 3 E., M. D. M., is $3\frac{1}{2}$ miles north of Magalia near Coutolenc at an elevation of 2600 ft. The property consists of 80 acres of patented railroad land on which a channel is said to have been discovered in 1855.

The channel is said to have a course NW.-SE. and to carry from 2'-4' of uncemented gravel with a few large boulders. It is about 80 ft. wide and capped with two flows of lava. It is opened up by a 500-ft., 2-compartment shaft 4' x $10\frac{1}{2}$ ' with 250' of drifts. The gravels

thus far taken out have been sluiced but are said not to have paid for mining.

Equipment consists of one double-drum hoist with both steam and electric connection; one 120 h.p. steam duplex compressor; one 75 h.p. electric compressor; one 35 h.p. electric compressor and four 4-stage turbine pumps, each with a capacity of 700 gallons per minute. Two power houses have recently been built on the west branch of Feather River, each capable, it is said, of generating 350 volts.

When operating, about 26 men are employed, who take out about 70 cars of material. Miners receive \$3.00 per shift and muckers \$2.50 per shift. Owned and operated at intervals during the last 13 years by the P. B. Steifer Mining Company of Coutolenc, a stock company with P. B. Steifer, president; M. V. Steifer, secretary; and S. M. Steifer, treasurer.

The **Strang** prospect is $\frac{1}{4}$ mile west of Oregon City at an elevation of 1375 ft. and includes 240 acres. A 100-ft. tunnel on the property was run too high. In 1895 a 50-ft. shaft was being sunk below the tunnel level. Idle.

Bibl.: Rept. XIII, p. 93, 1895-6.

The **Tabbe** prospect in T. 22 N., R. 5 E., is near Rock Creek about 6 miles SE. of Concow. The property includes 4 claims and 1 extension consisting of 520 acres unsurveyed. Water is ditched $\frac{1}{2}$ mile from Little Rock Creek. A channel is said to occur, on the property, with granite bedrock. A 200-ft. tunnel is said to have been run in bedrock but struck the channel too high. It is planned to run another tunnel. Owned by J. N. Stanley, Wm. Delaney of French Gulch, W. H. King of Pulga or Flea Valley, and G. A. Stanley of Magalia.

The **Taylor** prospect is near Pentz and nuggets are reported to have been taken out by a Mr. Clark of Chico.

The **Turner** mine is 1 mile east of Bangor on a channel reported to be 40 ft. wide with a course NW.-SE. Pay gravel is reported to have averaged 8 ft. deep on a bedrock of slate. The channel was opened up by two 50-ft. shafts on either side of the channel with drifts run from each across the channel. The gravel was run through an arrastra which loosened up the gold from the cement gravel. Idle.

Bibl.: Rept. XII, p. 89, 1894; XIII, p. 93, 1895-6.

The **Undine** property on Butte Creek, 15 miles from Chico is under lease to Geo. F. Dyer and the Undine Operative and Mining Company of Chico.

The **Wescott** mine is on the south edge of Philbrook Valley at an elevation of 6000 ft. It consists of 1 claim adjoining the Butte King and Butte Queen claims. A 600-ft. bedrock tunnel was run under the west rim and coarse gold in cement gravel taken out. Idle.

Bibl.: Rept. X, p. 140, 1890.

The **Willard** claim is 1 mile northeast of Magalia and consists of 5 claims located in 1852. The property has yielded to date seven large nuggets valued at from \$2000 to \$10,690 apiece. A quartz ledge is reported near a slide from Sawmill hill. Owned by F. H. Dakin, No. 110 Sutter st., San Francisco.

The **Wilson** mine is $3\frac{1}{2}$ miles north of Magalia at an elevation of 2500 ft. It consists of 1200 acres on which are a 200-ft. shaft to bedrock and a 300-ft. bedrock tunnel but as yet no channel has been opened up. Idle.

Bibl.: Rept. XIII, p. 94, 1895-6.

The **Woods** property is in Sec. 26, T. 24 N., R. 3 E., M. D. M., 4 miles north of Lovelocks. It consists of 160 acres on which three bedrock tunnels in slate 800', 700' and 200' have been run in an easterly direction. Some stoping has been done in the 70-ft. tunnel and coarse gold in blue gravel taken out. Water is ditched $1\frac{1}{2}$ miles from Little Butte Creek. Idle.

Bibl.: Rept. X, p. 140, 1890.

GOLD—HYDRAULIC MINES.

Hydraulic mining has not been carried on in Butte County in recent years. Present laws would demand the construction of debris dams before active work could be undertaken.

The **Spring Valley** or **Cherokee** hydraulic mine, $\frac{1}{4}$ mile east of Cherokee, was located in 1854 and consists of 1500 acres in Secs. 4, 5, 28, 29, 32 and 33 of Tps. 20 and 21 N., R. 4 E., M. D. M. Hydraulicking at this property was stopped by the anti-debris laws in October, 1890. Working the property by drifting has not been considered feasible. Water for hydraulicking was taken from the headwaters of Big Butte Creek and the west branch of Feather River and the mine tailings were dumped into Sawmill Ravine from which they were conveyed into Dry Creek.

During the 36 years in which hydraulicking was carried on about 150 acres were worked to bedrock, with a 500-ft. face and nearly as much was worked to within 15 ft. of bedrock. The latter, lower,

cement gravel required blasting. In 1895 several small companies had leased portions of the bedrock and were cleaning it up. Since then "fossickers" have done some work. Idle. Owned by the Spring Valley Gold Mining Company. J. B. Whitcombe of Cherokee, receiver.

Bibl.: Repts. X, p. 124, 1890; XIII, p. 92, 1895-6.



Photo No. 12.—View northeastward from a bridge two miles south of Pentz showing hydraulic tailings from the old Cherokee hydraulic mine.

GOLD—PLACER MINES.

(Surficial or Sluicing.)

Gold is being recovered by small parties of miners in many of the creeks and ravines throughout Butte County. Nuggets of considerable size are sometimes found and in some localities platinum is associated.

In **Bald Rock Cañon** the **Middle Fork Mining Company** has been taking gold from the loose gravels in the rough creek bed. Their equipment consisted of an electric blasting outfit, 5-ton hoist, and barge on which was mounted a Corliss engine which ran an air pump supplying a diving suit. The gravel taken out is reported to have averaged \$7.00 per yard. The method of working does not permit of many yards per day and the values contained are necessarily uncertain.

The company consists of S. Hansen, J. Martin Sivertsen and John Schmitt, all of Oroville, and is reported to have been organized for the purpose of raising money to buy a gravel pump and other equipment. The permit allows the company to issue 28,000 shares of stock to the members of the company in exchange for their claim and all equipment, and to sell 22,000 shares at \$1.00 per share to net not less than \$.90 per share to carry out their purpose.

GOLD—QUARTZ MINES.

Considerable activity has been manifested by the quartz mines in Butte County the past year. Several of the old mines and prospects are being re-equipped for operations on a larger scale. Among the more noteworthy are the Banner, Bumblebee, Gold Bank, Kinkaid, Mascot, Oklahoma Wonder and Springer.

The **American Eagle** property is $4\frac{1}{2}$ miles west of Merrimac. In 1890 it was reported to have a 5-ft. quartz vein in granite striking NE.-SW. and dipping 45° E. Development consisted of a 600-ft. tunnel and a 1700-ft. tunnel with three raises to the surface. A small amount of stoping was done and the ore was run through a Dodge rock breaker, a 5-ft. Huntington roller mill and over two Triumph concentrators. Idle.

Bibl.: Rept. X, p. 123, 1890.



Photo No. 13.—Hoist and transformers at the Banner quartz mine south of Monte de Oro and four miles northeast of Oroville.

The **Banner** mine is 5 miles northeast of Oroville at an elevation of 580 ft. The property consists of 220 acres including 4 patented claims, the Old Banner, South Banner, Amosky and Clark. Early work was mostly done on the Little Banner vein which was about 18" wide and dipped NE. This vein connected with the Big Banner vein at a depth of 200 ft. The Amosky vein is reported to parallel the two Banner veins although it is probable that it is the same vein that is being exploited at the present workings of the Banner. The vein in the Banner mine averages 4 ft. wide while in the Amosky it is said to be 7 ft. wide on the 200-ft. level. The veins strike N. 15° E. The Banner vein dips 75° E. in a footwall of slate and a hanging wall of metamorphic sandstone.

Development work at the Banner consists of a 2-compartment shaft to 400 ft. but open only to the 200-ft. level on which drifts are being run N. 15° W. by 6 men in 2 shifts. Equipment consists of a 20 h.p. electric motor to run the hoist and a 75 h.p. electric motor to run a compressor. A 20 h.p. motor runs a 2-stamp Joshua Hendy mill equipped with one 4' x 5' and one 4' x 7' amalgamation table. The plant receives power from a new 4-mile line, built by the company, from the Pacific Gas & Electric Company.

Development work at the Amosky consists of a 600-ft. 2-compartment shaft, open and timbered to the 200-ft. level. The shaft runs N. 20° E. at an incline of 35°. Equipment consists of a Lambert steam hoist with Nagle boiler. The ore is trammed about 50 ft. to a bin.

It is planned to install a larger mill and concentrating equipment. Owned by the South Banner Mining Company. Geo. E. Gardner, president; Richard Phillips, secretary-treasurer and manager at Oroville.

The **Bishop and Wells** property is 3½ miles west of Merrimac. It is reported that a 3-ft. quartz vein occurs between granite and porphyry, striking N.-S. and dipping 45° W. Development consists of a 100-ft. tunnel on the vein. Equipment consisted of five 300-lb. stamps operated by an 8-ft. hurdy wheel driven by water from Clear Creek under a 40-ft. head. Idle.

Bibl.: Rept. XIII, p. 83, 1895-6.

The **Bluebird** mine is reported as 2½ miles north of Inskip at an elevation of 3850 ft. A 4" vein in decomposed porphyry strikes NE.-SW. and dips NW. Development consisted of a 30-ft. shaft and open cuts.

Bibl.: Rept. XIII, p. 83, 1895-6.

The **Bootjack** group consists of 5 claims in Sec. 10, T. 19 N., R. 6 E., M. D. M., near Forbestown. A quartz vein carrying free gold and pyrite is said to be 7 ft. wide at the surface and 15 ft. wide on the 100-ft. level. The ore is said to assay about \$6.00 per ton. Development consists of a 120-ft. shaft and a 15-ft. drift on the 100-ft. level. Equipment consists of a 60 h.p. steam boiler, hoist, 1-ton skip, a 3-drill compressor, 1 machine drill and 500 ft. of cable. Idle. Owned by Manuel Fernandez of Forbestown.

The **Bullion** mine is 1½ miles from Forbestown in Sec. 3, T. 20 N., R. 6 E., M. D. M. It consists of 1 claim adjoining the Keystone property to the west. Development consists of a 60-ft. tunnel in greenstone. The ore was milled in an arrastra in 1890. Idle.

Bibl.: Rept. X, p. 128, 1890.

The **Bumblebee** mine is in the NW. $\frac{1}{4}$ of Sec. 27, T. 20 N., R. 4 E., M. D. M., 4 miles northeast of Oroville at an elevation of 1090 ft. It consists of 2 claims, the Josephine and Bumblebee, including 36 acres. A quartz vein strikes E.-W. and dips S. 33° between a limestone footwall and slate hanging-wall. It outcrops at the surface about 200 ft. below the mine in a ravine which was placered in the early days.

Development consists of a 180-ft. incline shaft and 400 ft. of old stopes. Mine equipment includes a 40 h.p. International kerosene engine, Gardner, 10" x 10" compressor, and air drills; an 800-ft. steam



Photo No. 14.—Hoist and mill at the Bumble Bee quartz mine on the west side of Oregon Gulch, six miles northeast of Oroville.

auxiliary hoist and 40 h.p. boiler with a 3000-gallon supply tank 250 ft. above the plant.

The mill equipment consists of an 8" x 10" Blake jaw crusher, a 38" x 4' ball mill and Eckleson concentrating table run by a 15 h.p. International kerosene engine, and ball mill with worm feed guaranteed for 36 tons in 24 hours, through 40-mesh screen. The mill equipment and kerosene engine are all new. Water for the mill is obtained from the Pacific Gas and Electric Company's ditch 75 ft. above the mill. Four men were employed in the mine. Owned by the Butte Gold Mining Company, No. 505 Consolidated Realty Building, Los Angeles. C. B. Ford, president; C. D. Falstead, secretary and treasurer; W. M. Ford, general manager at Oroville.

The **Burlington** group near Forbestown is reported to have been taken over by the Ralston Development Company, organized by W. C. Ralston of San Francisco, with an authorized capital of \$3,000,000 for the purpose of acquiring and operating the Burlington claims,

the option for which calls for \$130,000. The company has been permitted to sell 20,000 shares at par, \$3.00 per share, to net not less than \$2.50 per share.

The **Butte Creek** property is on Big Butte Creek, 1 mile east of NimsheW. An 18" quartz vein strikes NW.-SE. and dips 45° E. between a footwall of slate and a hanging wall of limestone. Two tunnels 160' and 80' long and 70' apart were run on the vein and the ore blocked out was stoped. The mill consisted of ten 750-lb. stamps and two Frue concentrators run by water-power.

It is reported that 22 tons of ore were shipped to the Selby smelter in November, 1915, to determine the value of the property. Operated by a company including Frank Whittock and K. D. Crowder of Chico.

Bibl.: Repts. XII, p. 82, 1894; XIII, p. 83, 1895-6.

The **Cain** prospect is $\frac{7}{8}$ mile south of Inskip at an elevation of 4250 ft. A quartz vein in slate strikes E.-W. and dips north. A tunnel has been driven on the vein. Idle.

Bibl.: Rept. XIII, p. 83, 1895-6.

The **Carlisle** property includes 640 acres 2½ miles southeast of Forbestown, on the south fork of the Feather River, at an elevation of 1275 ft. A 9-ft. vein of ribbon quartz is reported to carry free gold with galena, pyrite and chalcopyrite. It strikes NE.-SW. and dips 50° NW. between slate and porphyry. The vein has been prospected by a shaft and two crosscut tunnels. Water power is available. The tunnels are reported to have recently been opened.

Bibl.: Rept. XIII, p. 83, 1895-6.

The **Clark Brothers** mine is 10 miles east of Yankee Hill in the Concow district at an elevation of 2300 ft. A 135-ft. tunnel is reported to have been run along the vein and the ore milled in a 12-ft. arrastra. Idle.

Bibl.: Rept. XIII, p. 84, 1895-6.

The **Crystal Hill** property is reported as 3 miles northwest of Enterprise at an elevation of 1100 ft. An 18" vein in granite strikes E.-W. and dips vertical. Development consists of a 100-ft. tunnel and a raise to the surface. The ore was milled by four 750-lb. stamps run by water power.

Bibl.: Rept. XIII, p. 84, 1895-6.

The **Crystal Peak** property is reported to be 3 miles north of Enterprise at an elevation of 1100 ft. A 50-ft. quartz vein in granite strikes E.-W. and dips vertical. Ore from a 150-ft. tunnel on the vein was milled by two 750-lb. stamps operated by water power. Idle.

Bibl.: Rept. XIII, p. 84, 1895-6.

The **Defiance** property is reported to be 9 miles north of Oregon City. Two parallel veins between slate and porphyry were developed by a 90-ft. shaft.

Bibl.: Rept. XII, p. 82, 1894.

The **Dutch Ravine** property is reported to be 3 miles south of Hurlleton. A quartz vein from 2'-5' wide strikes N.-S. and dips W. in slate. A 135-ft. shaft was sunk on the vein.

Bibl.: Rept. XII, p. 82, 1894.

The **Edna M.** or **Buzzard** property is reported to be $2\frac{1}{2}$ miles west of Inskip at an elevation of 3850 ft. A 3" seam of quartz strikes NE.-SW. and dips SE. Two tunnels 80 ft. and 200 ft. long connected by a raise followed the seam which carried high values. A 400-ft. crosscut tunnel was also run. The quartz was panned and the tailings were run through an 8-ft. arrastra operated by a 9-ft. undershot wheel run by water from Cherokee ditch. Idle.

Bibl.: Rept. XIII, p. 85, 1895-6.

The **Eureka** quartz mine is on the property of the old Mugford drift mine in Sec. 3, T. 22. N., R. 3 E., M. D. M., $2\frac{1}{2}$ miles SW. of Magalia. It consists of a 240-acre patent on which a dike of porphyry from 40' to 60' wide is said to be enriched by cross stringers of quartz and to assay from \$0.40 to \$123.00 per ton. The gold occurs free and with sulphides. The dike is said to be exposed along the surface for about $\frac{1}{4}$ mile.

A 290-ft. tunnel with entrance 75 ft. below the outcrop of the dike has not yet crosscut it since it is said to dip away from the direction in which the tunnel has been run. Equipment consists of a 6 h.p. gas engine, jackhead pump and 2 mine cars. Owned by Chas. Crowder ($\frac{1}{2}$) and H. W. Whitten ($\frac{1}{2}$) of Chico.

The **Excelsior** or **Mammoth** mine is 4 miles northwest of Inskip at an elevation of 3925 ft. It is reported that a 3-inch seam of quartz in slate strikes N.-S. and dips vertically. Development work consists of a 240-ft. tunnel and a 100-ft. shaft on the vein. The mill consisted of four 350-lb. double-stem stamps with square shoes and dies. Idle.

Bibl.: Rept. XIII, p. 85, 1895-6.

The **Exposition 1915** mine at Lumpkin is reported to be developing an 18-inch quartz vein. Development consists of a 125-ft. tunnel on the ledge with 200 tons of ore blocked out. The ore is reported to mill \$12.00 per ton, while the concentrated sulphurets are reported to assay up to \$80.00 per ton. A stamp mill on the property is run by water power. Owned by Frank C. Burroughs and A. F. Thorselius of Lumpkin.

The **Fitzpatrick** property is $\frac{3}{4}$ mile from Inskip at an elevation of 4250 ft. A quartz vein in granite is reported to strike N.-S. and dip 60° E. A 495-ft. tunnel has been run. Idle.

Bibl.: Rept. XIII, p. 85, 1895-6.

The **Gallagher** and **Perkins** property is in Secs. 10 and 15, T. 24 N., R. 4 E., M. D. M., near KimsheW. An 18-inch quartz vein, reported to occur along a contact of granite and porphyry, strikes N. 30° E. and dips 30° W. Development work consists of a 130-ft. tunnel on the vein and a 60-ft. crosscut tunnel. A 10-stamp mill stood on the property in 1890. Water was obtained from the mine. Idle.

Bibl.: Rept. X, pp. 133-4, 1890.

The **Gold** or **Rees Ledge** property is in Sec. 21, T. 25 N., R. 5 E., M. D. M., at an elevation of 6050 ft. A quartz vein in slate strikes NW.-SE. and dips W. The free-milling ribbon quartz is reported to have averaged \$20.00 per ton. A tunnel was started in 1890 to tap the vein at a depth of 300 ft. below the surface. Idle.

Bibl.: Rept. X, p. 133, 1890.

The **Gold Bank** group of mines is located $\frac{1}{4}$ mile northeast of Forbestown at an elevation of 2820 ft. The property as consolidated includes the Gold Bank Group, Golden Queen, Shakespeare and Miller, consisting of 1035 acres with timber lands; also the "R. R.," Gold Quartz, Conjunction Gold Quartz, Oroville No. 1 (Placer) and Oroville No. 2 (Placer) consisting of 255 acres. A patent was applied for in 1916.

Development consists of an 8'x8' lower tunnel driven 1600 ft. to intersect a vein of quartz 500 ft. vertically below the mine workings. Mining equipment consists of a 4-drill Rand compressor and power drills. Mill equipment consists of an old 40-stamp mill with amalgamation plates and 16 Frue concentrators. Water is obtained from the Forbestown ditch.

At the old Gold Bank mine 5 stamps were reported to be operating in November, 1915, and 10 stamps in December, 1915, during which time \$8000.00 in gold was produced. The concentrates were shipped to a Utah smelter.

Owned by the Forbestown Consolidated Gold Mines Company, M. J. Cooney of Forbestown, manager; Fred J. Stoer, secretary and treasurer. Under bond and lease to the California Gold Mines Company of Salt Lake City, Chas. W. Reese of Salt Lake, general manager.

The **Golden Eagle** property is 3 miles north of Paradise in Sec. 3, T. 22 N., R. 3 E., M. D. M., on the SE. portion of the Mineral Slide drift property. An 8-ft. vein, cut by Little Butte Creek, strikes NW.-SE. and dips 45° NE. Development work consists of a 500-ft. tunnel

and an 86-ft. shaft on the vein, while south of it are two tunnels 150' and 400' long. A mill, in 1890, was equipped with a rock breaker, Hendy self-feeder, 20 stamps, 6 concentrators and a reverberatory roasting furnace. Idle.

Bibl.: Rept. X, p. 135, 1890.

The **Golden Fissure** property is $3\frac{1}{2}$ miles west of Enterprise at an elevation of 1500 feet. A 4-ft. quartz vein strikes E.-W. and dips vertically in granite. Development work in 1895 consists of a 100-ft. tunnel.

Bibl.: Rept. XIII, p. 86, 1895-6.

The **Golden Queen** property is $\frac{1}{2}$ mile north of Forbestown. A 20-ft. quartz vein strikes NE.-SW. and dips N. 20° . The ore was sorted in the mine and the low grade used for filling. The picked ore averaged \$5.00 per ton in free gold and $1\frac{1}{2}\%$ sulphurets. The ore is reported to carry pyrite, galena and some telluride.

Equipment in 1892 consisted of a No. 2 Gates crusher and ten 750-lb. stamps operated by water power. Apron, sluice plates, blankets, sluices and 16-ft. buddle were used to save the gold.

Bibl.: Rept. XI, p. 162, 1893.

The **Golden Summit** property is 18 miles east of Powellton in Sec. 21, T. 25 N., R. 5 E., M. D. M., at an elevation of 6600 ft. It consists of a 320-acre patent on which an 8-ft. quartz vein strikes N. 66° E. and dips vertically between syenite and greenstone.

Development in 1895 consisted of a 250-ft. incline shaft tapped at 100-ft. depth by a 400-ft. drain tunnel. Drifts were run 400' east and 400' west on the 100-ft. level, and 300' east and 250' west on the 200-ft. level. Equipment consisted of ten 800-lb. stamps and two Woodbury concentrators run by steam power.

Bibl.: Rept. XIII, p. 86, 1895-6.

The **Golden Thread** property is on Secret Creek $2\frac{1}{2}$ miles northwest of Inskip, at an elevation of 3550 ft. A 2-inch seam of quartz carrying coarse gold strikes NE. and dips W. in decomposed rock. Development work in 1895 consisted of open cuts and tunnels with stoping to the surface. Idle.

Bibl.: Rept. XIII, p. 86, 1895-6.

The **Inskip** property is $\frac{1}{2}$ mile southwest of Inskip in Sec. 29, T. 25 N., R. 4 E., M. D. M. Two parallel veins, one of which is from 6"-3' and another $2\frac{1}{2}'$ wide are about 20 ft. apart. A 100-ft. drift run between the two veins is reported to have developed 125 ft. of backs. Crosscuts were run to the vein. The ore was hand sorted and

run through an 8-ft. arrastra operated by a 16-ft. overshot wheel with water from the Cherokee ditch.

Bibl.: Rept. XII, p. 84, 1894.

The **Keystone** property is reported to consist of one claim $\frac{1}{2}$ mile northwest of Forbestown in Sec. 3, T. 20 N., R. 6 E., M. D. M. Development work consisted of a 120-ft. incline shaft on the vein at an angle of 45° , an 80-ft. perpendicular shaft and a tunnel in greenstone. Idle.

Bibl.: Rept. X, p. 127, 1890.

The **Kinkaid** mine is in Sec. 7, T. 21 N., R. 5 E., M. D. M., near Shields Gulch, 6 miles northwest of Berry Creek. The property includes 157 acres of patented land purchased from the railroad.

A 10-ft. quartz vein in porphyry strikes NW.-SE. and dips 15° NE. The ore is said to mill \$7.00 per ton in free gold; \$6.00 in gold per ton is recovered by cyaniding and the tailings assay \$6.00 per ton. The sulphides are concentrated.

Development consists of a 100-ft. tunnel and 50-ft. winze. Experimental equipment consists of a Kendall 1-stamp mill and a Chilean rotary mill run by two 6 h.p. gasoline engines; a jaw crusher run by an 8 h.p. gasoline engine; and a concentrator run by a 2 h.p. gasoline engine. Three men were employed in December, 1916. Owned by M. P. Kinkaid of Oroville and Mr. O'Neill of Nebraska. Jack H. Kinkaid, superintendent.

The **Lost Treasure** consists of one claim on Dutch Gulch, $\frac{3}{4}$ mile north of Inskip, in Sec. 28, T. 26 N., R. 4 E., M. D. M. Pockets of gold were found in quartz stringers, some of which were 12 inches wide in altered syenite. In 1894, a 150-ft. tunnel was reported to have been driven NE. along the strike of the quartz veins.

Bibl.: Rept. XII, p. 86, 1894.

The **Lucky Bob** prospect is 4 miles north of Oroville. A 2-ft. quartz vein in slate and greenstone is reported to strike W. of N. and dip 55° W. A 550-ft. tunnel was driven along the vein.

Bibl.: Repts. XII, p. 86, 1894; XIII, p. 87, 1895-6.

The **Mascot** property is in the SW. $\frac{1}{4}$ of Sec. 27, T. 20 N., R. 4 E., M. D. M., 5 miles northeast of Oroville, at an elevation of 980 ft. It consists of a 40-acre patent on which two veins are being worked. A 6"-18" sugary quartz vein exposed in a 75-ft. upper tunnel strikes N. 10° W. and dips 40° NE. A vein striking N. 35° E. is being worked in a tunnel 75 ft. in elevation below the upper tunnel. Stopping has been carried nearly 30 ft., to the surface, for a distance of 30 ft. along the vein in the upper tunnel.

Mine equipment consists of a bunk house, shop, car, etc. A Joshua Hendy triple-discharge 3-stamp mill was being installed in December, 1916.

Owned by Wm. Ford and C. A. Grummet of Oroville, and Jas. Wykoff of Woodleaf. Option held by W. T. Baldwin, manager, of Oroville, and John Upton, superintendent.

The **Matheson** or **Meredith** property is $4\frac{1}{2}$ miles north of Nimshew on the south side of Big Butte Creek, in Sec. 2, T. 23 N., R. 3 E., M. D. M., at an elevation of 2000 ft. A 10-inch quartz vein is reported to strike NW.-SE. and dip 30° E. between a footwall of slate and a hanging wall of serpentine. Mill equipment consisted of eight 850-lb. stamps and a 4-ft. Huntington roller mill. Water was ditched 1 mile. Idle.

Bibl.: Repts. XIII, p. 88, 1895-6; X, p. 135, 1890.

The **Mattie** property is 8 miles east of Oroville, near Miner's Ranch, at an elevation of 1100 ft. An 8"-30" quartz vein strikes E.-W. and dips 40° S. between greenstone and slate. Two prospect shafts 400' apart were 10' and 50' deep. Idle.

Bibl.: Rept. XIII, p. 88, 1895-6.

The **Mosquito Creek** property is reported to be $\frac{1}{2}$ mile east of Coutolene, at an elevation of 2750 ft. Three parallel quartz veins are reported to occur in slate, one of which strikes N.-S. and dips 60° E. Idle.

Bibl.: Rept. XIII, p. 89, 1895-6.

The **Mount Ida** property is $2\frac{1}{2}$ miles northeast of Hurleton at an elevation of 1430 ft. An 18-inch quartz vein in diorite strikes N.-S. and dips 54° W. Development work consists of a 25-ft. shaft, tunnel and open cuts. Idle.

Bibl.: Rept. XIII, p. 89, 1895-6.

The **New Oregon, Forty-nine** or **Red Point** mine is $1\frac{1}{2}$ miles east of Enterprise at an elevation of 1625 ft. It consists of a 160-acre patent on which a 12-ft. quartz vein strikes E.-W. and dips 60° S. between slate and porphyry. Development work in 1895 consisted of 2 cross-cut tunnels with short drifts. Idle.

Bibl.: Rept. XIII, p. 89, 1895-6.

The **Oklahoma Wonder** property is 5 miles northeast of Oroville in Sec. 27, T. 20 N., R. 4 E., M. D. M., adjoining the Mascot mine. An 18" sugary quartz vein carrying free gold strikes N. 75° W. and dips 35° S. Development consists of a 10-ft. incline shaft just started.

An old mill with five 250-lb. stamps has been installed, with 3' x 4' plate and Challenge feed, to work the upper oxidized ore. The decomposed vein material near the surface pans very well and the surface thereabouts has been ground sluiced in the early days. Owned by Mary I. Hedge of Oroville. Option held by W. T. Baldwin and John Upton of Oroville.

The **Owl** property is 2 miles northwest of Inskip at an elevation of 3925 ft. A rich seam of quartz in porphyry strikes N. and dips W. The ore was milled in an 8-ft. arrastra. Idle.

Bibl.: Rept. XIII, p. 90, 1895-6.

The **Pactolian** property is 2 miles north of Hurleton at an elevation of 1600 ft. A 2'-8' quartz vein strikes NE.-SW. and dips SE. between diorite and slate. Development work consisted of a tunnel.

Bibl.: Rept. XIII, p. 90, 1895-6.

The **Palo Alto** property is 3 miles north of Merrimac. It is reported to include a 3-ft. quartz vein striking N.-S. and dipping 75° E. between granite and porphyry. The vein has been opened up by five tunnels. Equipment consisted of a 12 and a 10-stamp mill operated by water power, a Blake rock crusher and 2 Frue concentrators. Idle.

Bibl.: Repts. X, pp. 129-130, 1890; XIII, p. 90, 1895.

The **Phoenix** property includes three claims 3 miles south of Hurleton in Sec. 28, T. 19 N., R. 5 W., M. D. M., at an elevation of 1600 ft. A 2'-8' quartz vein strikes N.-S. and dips vertically. Development consists of a 105-ft. shaft, short drifts along the vein and some stoping.

In 1894 the mine was equipped with a horse-whim hoist and the mill with a Dodge rock breaker, with Stanford self-feeder and a Bryan roller.

Bibl.: Repts. XIII, p. 90, 1895-6; XII, p. 87, 1894.

The **Pinkston** property is 10 miles east of Yankee Hill, at an elevation of 2300 ft. A 2'-4' quartz vein is reported to strike N.-S. and dip vertically. Development consists of a 60-ft. shaft and 80 ft. of drifting on the vein. The stamp mill has been removed. Idle.

Bibl.: Rept. XIII, p. 90, 1895-6.

The **Poumarat** property is on Little Butte Creek, 1½ miles northwest of Lovelocks, at an elevation of 2600 ft. A 2-ft. vein in slate strikes N.-S. and dips 45° E. Development consists of a 100-ft. two-compartment shaft with a 100-ft. drift N. on the 70-ft. level.

Bibl.: Rept. XIII, p. 91, 1895-6.

The **Rainbow** property consists of a 40-acre patent on Jordan Hill, 4 miles northwest of Yankee Hill in Sec. 29, T. 22 N., R. 4 E., M. D. M. A 2½-ft. quartz vein strikes E.-W. and dips 50° N. between slate and serpentine. Development consists of an incline shaft with drifts east and west. A 5-stamp mill stood on the property in 1895-6.

Bibl.: Repts. XI, p. 58, 1892; X, p. 131, 1890.

The **Ramona** or **Skipper** property includes 40 acres 1½ miles south of Magalia, at an elevation of 1900 ft. Two quartz veins, from 3'-10' wide, in syenite are reported to strike N. 65° E. and dip 75° SE. Development in 1895 consisted of a 46-ft. tunnel on the vein; and the equipment included ten 850-lb. stamps. Water was obtained from the Cherokee and Miocene ditches.

Bibl.: Rept. XIII, p. 91, 1895-6.

The **Rawhide** property consists of 1 claim, 2 miles north of Inskip, at an elevation of 4300 ft. A quartz vein from 4'-30' wide strikes N.-S. and dips 75° E. in slate. Development consisted of a 25-ft. incline shaft and a 25-ft. tunnel on a stringer of the main vein.

Bibl.: Rept. XIII, p. 91, 1895-6.

The **Resumption** property is 3½ miles east of Hurleton at an elevation of 1800 ft. A 3-ft. vein, reported to strike NE. and dip NW., has been opened up by a tunnel. The ore was run through a Phoenix mill.

Bibl.: Rept. XIII, p. 92, 1895-6.

The **Rock River** property consists of 3 claims located 9 miles north of Oroville, in Secs. 4 and 9, T. 20 N., R. 4 E., M. D. M., at an elevation of 1200 ft. A quartz vein from 20" to 3' wide strikes N. 48° W. and dips 45° SW. along a contact of slate and diabase. Development work consists of a 300-ft. incline shaft on the vein with three levels. Three drifts have been run north 300', 275' and 160', while two 100-ft. drifts have been run south. A 15 h.p. engine ran a hoist and No. 4 Dow pump.

Bibl.: Rept. XIII, p. 92, 1895-6.

The **Roeper** or **Midas** property is 1½ miles west of Inskip. Three quartz veins strike NE.-SW. along a contact of slate and porphyry. It is said that one vein is low grade, another carries sulphides and a third carries free gold. The latter vein is said to vary from 4" to 12" wide. Development work done during the last 5 years consists of a 1500-ft. tunnel and considerable crosscutting.

Owned by the Chico Consolidated Gold Mining Company. John Roeper, manager, 416 Second st., Chico. Reported sold to J. H. Sharp of San Francisco.

The **Southern Cross** mine in Sec. 32, T. 20 N., R. 6 E., M. D. M., near Enterprise, is reported to have opened up a quartz vein in granite which varies in width from a seam up to 6 ft. It strikes NE.-SW., dips 60° NW. and is developed by a 200-ft. tunnel. Mill equipment consisted of four 850-lb. stamps, 2 Banner mills, a ball mill and a Woodbury concentrator. Owned by L. Rosenthal of San Francisco.

Bibl.: Register of Mines and Minerals, Butte County, pp. 8 and 9, 1903.

The **Spring Valley** property consists of 42 acres located 2 miles southeast of Cherokee, at an elevation of 1600 ft. A 5-ft. quartz vein is reported to strike N. 80° W. and to dip 40° E. Development consists of a 400-ft. tunnel on the ledge and an 800-ft. crosscut tunnel with a 28-ft. raise to the vein. Mill equipment consisted of ten 850-lb. stamps. Idle.

Bibl.: Rept. XIII, p. 92, 1895-6.

The **Springer** or **Gold Dike** property is 2 miles north of De Sabla and 8 miles northwest of Magalia in the E. $\frac{1}{2}$ of Sec. 34, T. 24 N., R. 3 E., M. D. M., at an elevation of 2350 ft. The roads are good during the dry season. The property includes 6 claims, the Paul Jones Placer, American Ravine Placer, Trenton Placer, Tiger Lily Quartz, Twilight Quartz, and D. A. Matheson Quartz.

The porphyritic dike from 200'-400' wide and 1 mile long has been prospected by sluicing and found to carry rough coarse gold associated with quartz stringers. It is estimated that the ore will average about \$1.00 per ton milled while the cost of mining and milling will not exceed \$0.50 per ton. The recovery of gold by milling is expected to be about four times greater than by sluicing.

The ore is blasted and handled by a steam shovel, on benches and in open cuts, which dump it in chutes which lead to receiving bins. Equipment consists of a churn drill, an American No. 28 steam shovel with $\frac{5}{8}$ cu. yd. bucket, 200-ton receiving bin, grizzly, 16" x 30" jaw crusher, ball mills (two 6' x 5', one 5' x 3', one 4' x 3'), 6 Deister Simplex concentrating tables, amalgamation tables. Plans call for a 700-ton mill bin with conveyor belt from the receiving bins, a 50 h.p. electric motor to run the crusher and a 5 h.p. motor to run 3 Challenge feeders.

Electricity will be obtained from the Pacific Gas and Electric Company. Water is secured from American Ravine. The tailings will be turned into the west branch of Butte Creek.

Twelve men were employed in December, 1916, during the installation of equipment, buildings, etc., by H. M. Thompson, superintendent. Owned by the Springer Consolidated Mining Company of New York.

The **Shakespeare** property is at Forbestown. A 4-ft. quartz vein in syenite and greenstone is reported to strike N.-S. and dip 80° W. Development consists of a 250-ft. shaft with some drifting. In 1894 the mill was equipped with thirty 1000-lb. stamps, 12 Frue concentrators and a chlorination plant. Idle.

Bibl.: Repts. XII, p. 88, 1894; XIII, p. 92, 1895-6.

The **Slater** property is 2½ miles east of Enterprise at an elevation of 1100 ft. A 7"-4' quartz vein in granite strikes E.-W. and dips N. Development consists of a 190-ft. crosscut tunnel and a 200-ft. shaft on the vein with some stoping. Equipment in 1895 consisted of a 10-ft. arrastra run by steam power. A 2½-mile ditch carried water from Slater ravine. Idle.

Bibl.: Rept. XIII, p. 92, 1895-6.

The **Standard Gold and Silver Companies** mine is at Oregon City, 8 miles northwest of Oroville at an elevation of 1425 ft. It consists of two claims on which four 18" parallel quartz veins occur in greenstone and syenite. The veins strike NW.-SE. and dip 35° SW.

Development work consists of a 487-ft. single-compartment incline shaft with 4 levels. Drifts in 1895 were as follows: 135-ft. level drifts N. 219' and S. 227'; 239-ft. level, drifts N. 197' and S. 200'; 387-ft. level, drifts N. 48' and S. 105'. Ore is reported to have been stoped from the second level to the surface. The mine made considerable water.

Equipment in 1895 consisted of a 20 h.p. engine which ran 3 Knowles pumps and several Hooker pumps, a 4-ft. Bryan roller-mill, Midas amalgamator and 2 Frue vanners. Idle.

Bibl.: Rept. XIII, p. 93, 1895-6.

The **St. Lawrence** property is 2 miles north of Inskip at an elevation of 4325 ft. A quartz vein in slate strikes NW. and dips E. Developed by open cuts and shallow pits. Idle.

Bibl.: Rept. XIII, p. 93, 1895-6.

The **Sunbeam** property near Yankee Hill has a 3½-ft. quartz ledge reported as being developed by J. L. Charles, Wm. and Ray Develter, Gus Forthous and L. H. Fields of Oroville. A 5-stamp mill was reported to be under construction in February, 1916.

The **Triumph** prospect is near Lumpkin. A quartz vein is being prospected by open cuts. Water is available. Owned by F. A. Thompson of Goldfield, Nevada.

The **Wild Yankee** or **Bessie** property is 3¾ miles northwest of Inskip at an elevation of 3925 ft. Three veins are reported to strike NE.-SW. and dip nearly vertical. The principal vein is 4 ft. wide, in syenite, and prospected by a tunnel and open cuts. There are two tunnels

and an incline on the other veins. The ore was milled by an 8-ft. arrastra run by water power.

Bibl.: Rept. XIII, pp. 82 and 94, 1895-6.

MANGANESE.

Considerable manganese ore was shipped from Butte County in 1916. The large ore bodies, so far as development work has shown, were taken out, but it is possible that other deposits would bear more detailed investigation.

The **Binet** prospect is west of Clipper Mills. Insufficient work has been done to determine the size of the deposit. An option is held by J. A. Knox of Oakland. Owned by E. C. Binet of Clipper Mills.

The **Powell** property consists of a 120-acre patent in Sec. 35, T. 20 N., R. 7 E., M. D. M., 1 mile north of Clipper Mills. The manganese deposit is 8 inches wide and strikes N. 65° E. A 30-ft. shaft has exposed the ledge at its bottom. A 50-ft. open cut exposes 30 ft. of ledge matter carrying more or less manganese. This ledge strikes E.-W. and dips 30° N.

Small kidneys of chrome ore in serpentine have also been found on the property but no deposit of any size has been opened up.

Owned by E. V. Powell. Leased by Davis and Horning of Oroville who had not begun work when the property was visited.

The **Woolley** or **Bear Cañon** mine is in Sec. 35, T. 20 N., R. 7 E., M. D. M., 1½ miles northwest of Clipper Mills. A ledge of manganese ore strikes E.-W. and dips N. in amphibolite near an area of serpentine. A body of ore from 4'-20' wide and 50' long was opened up by a tunnel and stoped out in 1916. About 220 tons of 40% ore was shipped by the Noble Electric Steel Corporation who leased the property. The ore was hauled from the mine to Oroville by motor trucks for \$6.00 per ton. Owned by Geo. W. Woolley of Clipper Mills.

MINERAL SPRINGS.

The following brief descriptions are taken from U. S. Geological Survey Water Supply Paper No. 338, 1915.

Henderson Spring is at an elevation of 3450' in the bottom of the cañon of Big Butte Creek, 11 miles by road and trail north of Stirling City. Cold mineralized water issues from a steep bank of slate and is used for drinking purposes by miners of the vicinity.

Mount Ida Spring is situated 6 miles east of Oroville at an elevation of 800' in a wide ravine at the base of slopes of schistose rock. The water was well known to the Indians and later to white settlers, and formerly supplied a small drinking pool. A shaft has now been sunk to a depth of 13 feet to bedrock and a joint of pipe cemented into the

fissure from which the water issues. The clear fresh carbonated water is used locally for drinking purposes and was at one time bottled by the Oroville Soda Works. Owned by Judge J. C. Gray of Oroville. For an analysis of this spring water see U. S. Geological Survey Water Supply Paper No. 338, p. 230, 1915.

Richardson Springs are situated in the cañon of Mud Creek, 12 miles north of Chico. Saline water issues from tuffaceous sediments and is utilized for drinking and bathing purposes.

Three of the four principal springs rise within 30 yards of each other, between the hotel and bathhouse. Two of these form cemented drinking pools of slight discharge in which the water is strongly saline and sulphuretted. The central spring of the three rises in a concrete standpipe to a height of several feet above the ground and its water is thence conducted by a small flume to a heating boiler at the bathhouse. The yield is about $2\frac{1}{2}$ gallons per minute. The fourth spring, known as Montgomery Spring, rises in a cemented drinking pool about 300 yards farther eastward and yields about 2 gallons per minute of mildly sulphuretted water. A cemented drinking basin surrounds a fifth spring, known as Iron Spring, on the side of a ravine about 400 yards north of the main springs. The overflow is slight and the water has no distinctly mineralized taste. Natural gas from certain of these springs is stated to be utilized at the resort. For analyses of these waters see U. S. Geological Survey Water Supply Paper No. 338, p. 292, 1915.

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LASSEN COUNTY.

By W. BURLING TUCKER, Field Assistant.

Field Work in September, 1915.

DESCRIPTION.

Lassen County, in the northern part of the state, is bounded on the south by Plumas and Sierra counties, on the west by Shasta, on the north by Modoc, and on the east by the state of Nevada.

The county has an area of 4680 square miles. It is a succession of mountain ranges, those in the western half being heavily timbered, and interspersed with valleys, both large and small, wherein are located numerous lakes, of which there are twenty-two. The most prominent of these is Eagle Lake, which lies twelve miles north of Susanville, near the center of the county, among the eastern spurs of the Sierra Nevada range. It is fourteen miles long by six miles wide, having an area of 28,000 acres, and an elevation of over 5000 feet. Apparently, it has no outlet, but Willow Creek, which takes its rise immediately below the lake from several large springs, is supposed to be fed by the lake.

It is surrounded by mountains, some of them clothed with heavy pine timber that reaches to the water's edge. To the northeast, Fredonyer's Peak rises to an altitude of 8,000 feet. Honey Lake Valley is situated in the southeastern part of Lassen County, and comprises some 225,000 acres of agricultural land. About the center of the valley is located Honey Lake, a vast expanse of water, with a surface of 64,000 acres, at an elevation of 3949 feet above sea level. It is fifteen miles long from east to west, and four to twelve miles wide at its highest stage, when it attains a depth of ten feet; the water is alkaline. Two streams empty into this lake, Susan River from the west, and Long Valley Creek from the south. Surrounding this fertile valley on all sides are wonderful mountain ranges varying in elevation to almost 8000 feet above the sea. In the northern part of the county, sending their waters into the Pacific, we have a second Willow Creek and the Pit River. The mountains, too rough and high for agricultural purposes, afford excellent grazing, and therefore are devoted entirely to stock raising. Due to the recent volcanic activity of Lassen Peak, it is interesting to note that the Cinder Cone, which lies ten miles northeast of Lassen Peak, is situated in the southwestern part of the county, between Snag Lake and Lake Bidwell. The slopes of this cinder cone are covered with a loose material of scoria, lapilli, and a dull black volcanic sand.

This cinder cone is regular in form, with a smooth, dark surface. It rises to an elevation of 640 feet above the lowest point of its base

(6907 feet above the sea) with an average diameter of 2000 feet below and 750 feet across the top.¹

The pit has a depth of 240 feet, with a narrow bottom and partially slaggy slopes. The greater part of this country is covered with sheets of basaltic lava, volcanic ash and scoria; only occasionally do we find exposures of sandstones and shales, and some marl and clays.

The principal industries of the county are stock raising, dairying, mining, and lumbering.

RAILROAD FACILITIES.

Lassen County is reached and traversed by three different railroads: The Western Pacific crosses the county east and west in the southern part; the Southern Pacific Railroad comes in from the east, starting at Fernley, on the Central Pacific about thirty miles east of Reno, Nevada, and continues through Honey Lake Valley as far as Westwood, where the headquarters of the Red River Lumber Company are located; the Nevada-California-Oregon Railroad, commencing at Reno, Nevada, and ending at Lakeview, Oregon, traverses the entire length of the east side of the county.

MINING CONDITIONS.

Owing to the larger part of the country being covered by eruptive overflows, which obscure all indications of the presence of valuable mineral, there are only two places in the county where mining has been carried on, resulting in bullion shipments, the most prominent of which is the Hayden Hill mining district.

In the neighborhood of Susanville in the granite on the Diamond Mountain range, there has been some prospecting and development in the past, but at present there is only a small amount of activity in this district.

South of Coopervale in Secs. 29 and 32, T. 28 N., R. 10 E., some good copper prospects have been developed, showing values in gold and silver. Among the mineral resources of this county are copper, gems, gypsum, gold, silver and sulphur.

¹J. S. Diller, U. S. G. S., An. Rep. VIII, 395-432.

LASSEN COUNTY—Table of Mineral Production.

Year	Gold. value	Silver. value	Copper		Stone industry. value	Unappor- tioned
			Pounds	Value		
1880	\$25,900					
1881	71,000	\$1,000				
1882	100,000	20,000				
1883	20,000	5,000				
1884	50,000					
1885	15,000	150				
1886	25,812	135				
1887	24,108	304				
1888	50,000	200				
1889	97,503	215				
1890	14,890	300				
1891	3,676					
1892	15,400					
1893						
1894	35,283					
1895	25,000					
1896	40,300					
1897	49,100	850				
1898	37,460	300				
1899	28,898					
1900	19,807	676				
1901	5,900	200				
1902	23,410	244				
1903	91,162	1,203				
1904	116,993	1,515				
1905	4					
1906	4					
1907						
1908	7,284	783				
1909	¹ 116,327	¹ 1,463				³ \$217,521
1910	¹ 82,180	¹ 972				
1911						1,522
1912						
1913		2	2,259	² \$850	\$2,080	
1914		10	19,089	² 2,539	775	
1915					870	
Totals	\$1,193,333	\$35,522	21,348	\$2,889	\$3,675	\$219,043

Total Mineral Production of Lassen County, 1880-1915 (Inclusive).

Copper ²	\$2,889
Gold	1,193,333
Silver	35,522
Stone industry	3,675
Miscellaneous and unapportioned	219,043
Total	\$1,454,462

COPPER.

Mountain Meadows Copper Mine. This property is situated 6 miles south of Coopersville, in Secs. 29-32, T. 28 N., R. 10 E. The holdings consist of ten claims: 5 patented are, Copper Queen, Copper King, Native Copper No. 1, No. 2, and No. 4, and five locations, giving 7500 feet along the lode. The veins occur in a meta-andesite conglomerate,

¹Includes gold and silver in Lassen, Modoc and Colusa.²Includes precious metals of Lassen and Colusa.³Copper production erroneously reported from Lassen County in the years 1913 and 1914, on account of shipping point being Doyle, while producing copper mines were located in Plumas County.⁴Unapportioned, 1900-1909.⁵Combined with figures of other counties.

strike N. 29° W. and dip N. 61° E. The copper ores carry gold and silver values. Developments consist of shaft 100 feet deep and a tunnel 900 feet long, besides numerous open cuts on the veins. Idle. Mountain Meadows Copper Co., 316 Mars Bldg., Sioux City, Iowa, owners.

GOLD.

The Hayden Hill mining district has been described in Bulletin 594 of the United States Geological Survey by James M. Hill, and we have drawn freely from that paper in what follows:

HAYDEN HILL MINING DISTRICT.

This district is in the north central part of the county. The town of Hayden Hill is near the head of the west fork of Willow Creek, 16 miles south of Adin, at the west base of the low, rounded knob from which it is named. The nearest point on the Nevada-California-Oregon Railroad is Likely, about 30 miles east-northeast of Hayden Hill.

Topography.

The town of Hayden Hill lies at an elevation of 5400 feet, at the west base of the hill of that name, which attains an elevation of 6357 feet. This hill rises about 900 feet above the relatively level basalt-covered plains. On the south and west it has gentle even slopes to a point within 75 feet of the summit, which takes the form of a sharp peak. On the north and west it is very different as branches of Willow Creek have cut in close to the hill. On the north, there is an abrupt rise of 150 to 300 feet near the summit, below which the slopes are very steep for another 300 feet. On the east the hill rises 1200 feet in a little over a mile with a rather flat bench 1000 feet wide, 500 feet below the summit.

Geology.

Hayden Hill is composed of buff-colored to yellowish rhyolite tuffs. The bedding is distinct, being in some places horizontal and in others dipping very low to west-southwest. These beds differ in appearance, some of them being composed of rather coarse conglomeratic material, and others being fine-grained consolidated muds. At the summit of the hill these tuffs have been brecciated and silicified and cemented by white quartz. This hard rock forms the peak at the top of the hill, and the scarp along the north side.

The silicification and brecciation appear to have occurred in a fault that was slightly concave to the south-southeast, and which has raised the beds to the southeast forming Hayden Hill. This fault zone strikes about N. 50° E., and the amount of vertical displacement seems to have been greater to the east-northeast near the summit of the hill than in the vicinity of the town of Hayden Hill. The low flat to the south and

southwest of the hill is underlain by a soft, partly consolidated dirty buff-colored rhyolite tuff. The tuffs are probably of Tertiary age.

Ore deposits.

The veins of Hayden Hill are confined to the area west of the summit, and the richest of them occur in the long even-sloping southwest side.

The most productive veins were the Providence, Golden Eagle, Juniper, Brush Hill, and Hayden Gulch. There are two distinct sets of veins, one striking about N. 68° W. and the other N. 38° E. The northeast veins appear to be younger than the northwest veins, and movement along the Providence vein has displaced the Golden Eagle, as at the northwest end of all the levels the Golden Eagle swings to the north on approaching the Providence. The two northeast veins, near the main shaft of the Golden Eagle, clearly cut that vein.

Structure of the veins.

As a rule the veins of Hayden Hill have steep dips. In general the northwesterly fissures dip 60°–70° NE., though in many places in the Golden Eagle Mine the vein is vertical.

The northwesterly fissures are as a rule nearly vertical, but at the junction of the Providence and Golden Eagle veins the Providence has a dip of 45° SE. Most of the fractures are 1 foot to 10 feet wide, but some are as wide as 25 feet. The filling of all the veins is a soft, consolidated fault breccia of the adjacent wall rock, much of the material being as small as sand grains. Both the country rock and the ore are more or less iron-stained and the richest ore contains a large amount of pyrolusite. This rich ore occurs in irregular pockets throughout the main vein. The rich veins are remarkable for the small amount of quartz they contain. The gold in these veins occurs as small nuggets. It is not flattened, but is so fine that some particles will float when dried. It is never found in the fragments of rock, but always in the fine sandy and claylike material. This metal is a combination of gold and silver, worth about \$14.00 an ounce.

Origin of the shoots.*

The concentration of gold with manganese in certain well-defined shoots in the productive veins, and the fact that almost no sulphide minerals are present in them, lead one to conclude that the valuable ores are all secondary, due to concentration by oxidizing waters with a general downward movement. The present ground-water level, as shown by the Golden Eagle shaft, is about 625 feet below the surface, which is in the oxidized zone to present depth of shaft, 835 feet. The veins are certainly younger than the rhyolite tuffs, which are of Tertiary age.

*J. M. Hill, op. cit.

MINES.

Blue Bell Mine. See our Rep. IX, p. 213; XII, p. 148; and XIII, p. 200; Bulletin 594, U. S. G. S. This mine is situated on southwest slope of Hayden Hill, at an elevation of 5400 feet. Development consists of vertical shaft having a depth of 160 feet. Idle. H. P. Anderson and Albert Chittock of Hayden Hill, owners.

Brush Hill Mine. See our Rep. X, p. 276; XI, p. 241; XII, p. 148; XIII, p. 200; Bulletin 594, U. S. G. S. It is situated on Hayden Hill, at 6500 feet elevation. Developments: vertical shaft 500 feet deep; shaft 270 feet vertical and then 130 feet on incline. Idle. George A. Keller of Buffalo, N. Y., owner.



Golden Eagle Mine and Mill. Hayden Mining District.

Daisy Dean Mine. It is situated one mile southeast of Hayden Hill, on the north slope of Buckskin Hill. Shaft sunk to a vertical depth of 200 feet, on vein striking N. 35° W. in a rhyolite tuff. Levels were driven on the vein at 50', 100' and 200'. Idle. H. C. Watson of Bieber, Cal., owner.

Golden Eagle Mine. See our Rep. X, p. 275; XII, p. 149; and XIII, p. 200; Bulletin 594, U. S. G. S., pp. 30 to 38. It lies on the southwest slope of Hayden Hill. Holdings consist of 160 acres, including the following claims: Golden Eagle, Providence, Evening Star, Aileen, White Swan, Vincuna, and Tailings Placer claim. Two veins have been developed on this property; the Golden Eagle vein strikes N. 45°

W., dipping 75° NE., while Evening Star or Providence vein has a course of N. 38° E. with a vertical dip.

The Golden Eagle vein varies in width from 1' to 25'. The length along the lode on Golden Eagle vein is 3100 ft., while on Evening Star vein it is 4500 feet. Southwest of Golden Eagle vein, a 6' x 10' 2-compartment shaft has been sunk to a vertical depth of 835 feet. Levels have been driven on the vein at 150', 200', 300', 400' and 500' to the end lines of the Golden Eagle claim. The vein has been stoped out from 400' level for a distance of 400 feet east of shaft. West of shaft for about 300 feet the vein has been stoped from 400' to 220' level. On 150' level, crosscut from shaft 40' north to vein, with a drift 500' east, and 560' west on main vein; at 60' west of shaft there is a drift 240' west on a sub-parallel vein. On 220' level a crosscut was driven 20' north to vein with drifts 680' east and 400' west; at a point 40' west of shaft there is a drift 300' west on a sub-parallel vein. On 300' level, vein was cut 75' north of shaft, and drifted on 600' east and 600' west with a drift 300' east on sub-parallel vein. These parallel veins are from 20' to 40' apart on this level. On 400' level, crosscut 80' north of shaft to vein, with drifts 360' east and 580 feet west. On 500' level, crosscut 85' north to vein, with drifts 140' east and 250' west.

Milling. Owing to the fact that all the gold is free and is contained only in the fine material in the veins, crushing was early discovered to be unnecessary, so all ore was dried and screened, and only the fines milled.

There is a 150-ton mill and cyanide plant on the Golden Eagle claim. The ore from the mine was dried in a 10' x 20' Benjamin furnace, then put through a 1-inch mesh trommel, the oversize from which went onto dump. The undersize from the trommel was again dried in two 3' x 10' revolving furnaces and crushed to 4-mesh between rolls. It was again sized in a 4-mesh trommel, the oversize returning to the rolls, and the undersize dropping to a storage bin. The sized pulp was leached in twelve 50-ton cyanide tanks.

From the amount of fines contained in the dumps it appears that the drying had not been complete. It is reported that, owing to the large amount of slimes that was mixed with the coarse ore in the leaching tanks, which prevented proper percolation of the solutions, probably only about 50% extraction was made on the ores treated by this plant. Six men are employed retimbering shaft. Lassen Mining Company, 1004 Alaska Commercial Building, San Francisco, Cal., owners.

Gray Goose and Sunrise Mines (Hayseed and Hayden Gouge). They are situated on Hayden Hill to the northeast of the Golden Eagle claim, at an elevation of 6300 feet. Two veins have been developed on this property; the Hayseed vein has a course of N. 68° W. while Hayden Gouge vein strikes N. 45° E., both veins having a vertical dip.

There are three shafts on the property with depths of 300 feet and a tunnel on the Sunrise claim 400 feet long. Idle. Barney Fillingin of Hayden Hill, owner.

Idaho and Leora Mines. These mines are situated on the plain lying southwest of Hayden Hill. The vein on the Idaho claim strikes N. 35° W. and has a vertical dip. A shaft has been sunk on this vein to a vertical depth of 100 feet, developing a vein having an average width of 2 feet. The course of the vein on the Leora claim is E.-W., dipping 65° N. Two shafts have been sunk on this property, one being an incline on the vein 60 feet deep, the other shaft is sunk north of vein to a vertical depth of 100 feet. Idle. W. Snyder, John Bowden and O. L. Nave of Hayden Hill, owners.

Jumper and Mount Vernon Mines. These mines are situated on the summit of Hayden Hill, about a mile northeast of the town of Hayden Hill. Holdings consist of the following claims: Jumper, Mount Vernon, Burbank, Early Rose, Snow Flake.

The Mount Vernon claim is the only one that has been developed to any extent. The vein on this claim strikes N.-S., dipping 70° E. A shaft has been sunk to a vertical depth of 120'; at the 120' level, a crosscut has been driven 30' east to vein, at which point, a winze has been sunk 100' on the vein. The vein is a quartz-filled fissure, having an average width of 8 inches, and shows some pyrite. The formation is a rhyolite tuff. Idle. O. L. Nave of Hayden Hill, owner.

Juniper Mine. See our Rep. IX, p. 212; XII, p. 150; and XIII, p. 201. It is situated on the west side of Hayden Hill, at 6325' elevation. There are two veins on the claim; a N.-S. and an E.-W. vein; the developments have been confined to the latter near the crossing with the former. The workings consist of two shafts, one 300 feet deep, and the other 126 feet. Both workings are caved. Idle. G. H. Knight; J. Harvey Estate, of Adin, California; T. A. Roseberry Estate, of Susanville, California; John McFarling Estate, of Calistoga, California, owners.

Lucky Star (North Star) Mine. It is situated north of the town of Hayden Hill, at an elevation of 6100 feet. The vein is 2½ feet wide, course nearly N.-S., dips about 45° W. between brecciated rhyolite walls. Developments consist of vertical shaft on south end of claim 100 feet deep. Crosscut tunnel 210 feet long. At a point 45 feet east of portal a brecciated, rhyolite dike was cut 30 feet in width, with ore occurring on both sides of this dike. A drift has been driven on the west side of this dyke 175 feet south, also on east side a distance of 125 feet south, developing good ore on both walls of the dike. The ore from the mine is screened over 1" screen, the through size going to storage bin, while oversize material goes to waste dump. The sized material is

treated in two 10-ton leaching vats, the sands being given a six days treatment. Capacity of cyanide plant is three tons per day. Two men are employed. Under lease to G. J. Steel et al. of Alturas, California. Mrs. B. Arnett of Hayden Hill, owner.

PRODUCTION OF HAYDEN HILL.

There are no accurate figures of the production of Hayden Hill. Approximate estimates of the gold and silver output for certain mines furnished by residents of Hayden Hill to James M. Hill of U. S. Geological Survey, are as follows:

Juniper	\$600,000
Brush Hill	400,000
Evening Star	200,000
Hayden Gouge	20,000
Blue Bell	100,000
Providence	78,000
Hayseed	150,000
North Star	20,000
Golden Eagle	*25,000
Golden Eagle	†1,000,000
Total	\$2,593,000

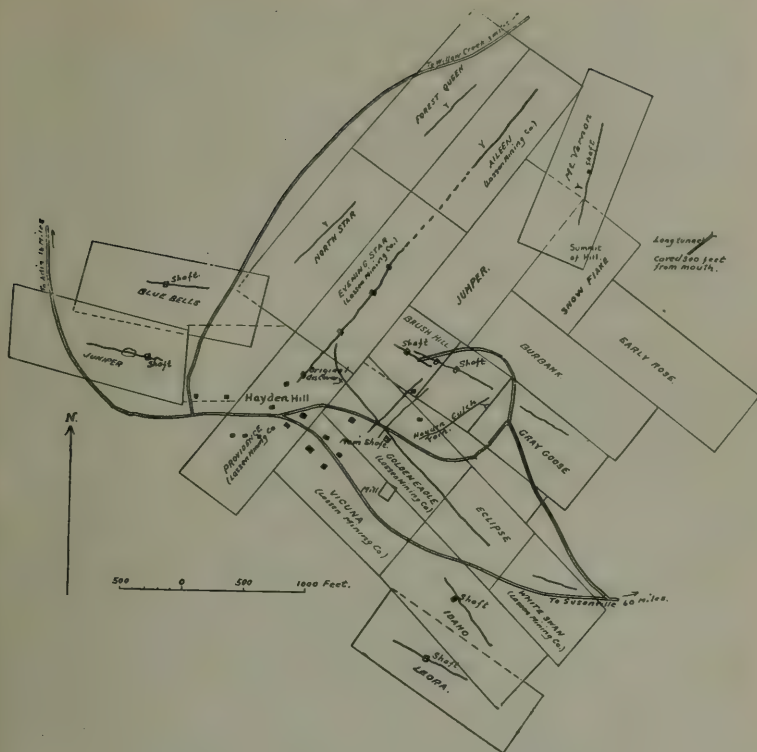
The following figures from 1880 to 1911 are taken from the reports of the Director of the Mint, and those for some years include the whole of Lassen County, during which time there were few producing mines outside of Hayden Hill.

Production of Hayden Hill District, Lassen County.

Year	Gold	Silver
1880 to 1883.....	\$307,712	\$26,285
1887	39,109	373
1888	50,000	200
1889		
1890	14,890	200
1891	3,676	
1892	15,400	
1893		
1894	35,283	
1895	25,000	
1896	40,300	
1897	49,100	850
1898	37,460	300
1899	28,898	
1900	19,807	676
1901	5,900	200
1902	19,810	247
1903	93,509	1,203
1904	115,993	1,514
1905	142,000	2,121
1906	397,105	1,169
1907		
1908	6,724	121
1909	115,475	1,450
1910	81,060	958
1911	2,500	277
	\$1,646,801	\$37,973

*Previous to 1901.

†Under Lassen Mining Co.



SKETCH MAP OF HAYDEN HILL, LASSEN COUNTY, CAL., SHOWING LOCATION OF THE PRINCIPAL CLAIMS AND VEINS.

As will be seen, there is a discrepancy of about \$600,000 between the two sets of figures. This is due probably to the method of collecting statistics in the early days, and the larger figures are considered more nearly correct.

DIAMOND MOUNTAIN MINING DISTRICT.

This district lies seven miles to the southwest of Susanville, on the eastern flank of the Diamond Mountain Divide. During the past years spasmodic attempts have been made to develop the quartz veins that occur in the granite of this main divide.

The only property in this district that has any recent developments is the Gold Belt Mine. The others are either abandoned, or only a small amount of surface prospecting has been done on them to hold the claims.

Gold Belt Mine. See our Rep. X, p. 274; and XII, p. 149. It is $7\frac{1}{2}$ miles southwest from Susanville and comprises 1500 by 600 feet. The vein strikes N. 45° E. and has a vertical dip, in granite, averaging 4 feet in width. Developments consist of two tunnels. The lower tunnel crosscuts the vein at a distance of 185 feet from portal; a drift has been driven 185 feet southwest on the vein. Fifty feet above the lower tunnel, a tunnel has been driven on the vein southwest 150 feet, and all ore stoped out to the surface. The quartz is pockety—the general run of the ore not being over \$3.00 per ton. The gold runs about \$12.00 to the ounce. Idle. George N. McDow of Susanville, California, owner.

MINERAL SPRINGS.

A large number of warm and hot springs issue from the lava-covered region of Lassen County. In a few places there are lake bed deposits of partly consolidated sands and clays. Areas of alluvium form occasional patches of meadow and valley land while in the neighborhood of Eagle and Honey lakes are found a number of warm and hot springs. The water from these springs is mostly saline in character.

Amedee Hot Springs. (See Water Supply Paper 338, by G. A. Waring, U. S. G. S.) These springs are situated at Amedee in Honey Lake Valley. In the alluvial land which slopes westward toward Honey Lake, scalding water forms several groups of shallow pools, mainly at six places in a belt about 600 yards long that trends nearly southward. About $\frac{1}{2}$ mile S. 30° W. from the southernmost of these main groups another hot spring forms a pool in the salt grass land. Temperature of springs is 172° to 204° F. The water is saline.

Analysis by F. M. Eaton, 1909.

Constituents	Parts per million	
	By weight	Reacting values
Sodium (Na) -----	232	10.18
Potassium (K) -----	4.9	.13
Calcium (Ca) -----	18	.90
Magnesium (Mg) -----	Trace	Trace
Iron (Fe) -----	1.8	.06
Aluminum (Al) -----		
Sulphate (SO_4) -----	269	5.60
Chloride (Cl) -----	161	4.62
Carbonate (CO_3) -----	27	.91
Silica (SiO_2) -----	94	3.12
Carbon dioxide (CO_2) -----	Present	Present
	810.7	-----

Bassett Hot Spring. (See Water Supply Paper 338, by G. A. Waring, U. S. G. S.). It is situated $2\frac{1}{2}$ miles east of Bieber, in Big Valley. The water rises with a temperature of 173° F. from a fissure in tuffaceous sandstone. Total flow of the spring is approximately 175 gallons per minute. The water has no distinct odor or taste, but the analysis shows the water to be moderately mineralized primary saline water of the sulphate type.

Analysis by F. M. Eaton, 1909.

Constituents	Parts per million	
	By weight	Reacting values
Sodium (Na) ----- }	224	9.74
Potassium (K) ----- }		
Calcium (Ca) -----	31	1.68
Magnesium (Mg) -----	Trace	Trace
Sulphate (SO_4) -----	377	7.85
Chloride (Cl) -----	101	2.86
Carbonate (CO_3) -----	21	.70
	757	-----

Highrock Spring. Situated 10 miles southeast of Amedee, on the Highrock ranch. A large thermal spring rises at the edge of Honey Lake Valley from basaltic lava that forms the hills to the east. This spring has a flow of 525 gallons per minute. Temperature 86° F., alkaline. The water is used for domestic supply and irrigation.

Shaffer Hot Springs (Braubecks). (See Water Supply Paper, 338, by G. A. Waring, U. S. G. S.) These springs are situated at Hot Springs Station on the Nevada-California-Oregon Railroad.

The principal spring rises with vigorous ebullition in a pool about ten yards in diameter, and is from one to two feet deep. Temperature 204° F. The flow of main spring is about 175 gallons per minute. Two other hot springs that discharge about 65 and 10 gallons per minute, respectively, also six or more hot pools that have no surface overflow, are formed in the nearly level salt grass area in a distance of about 125 yards southwest of the main spring.

Analysis of water from main spring by G. E. Colby of U. S. G. S.

Constituents	Parts per million	
	By weight	Reacting values
Sodium (Na) -----	304	13.22
Potassium (K) -----	9.4	.21
Calcium (Ca) -----	12	.90
Magnesium (Mg) -----	0.4	.03
Sulphate (SO_4) -----	349	7.27
Chloride (Cl) -----	207	5.84
Carbonate (CO_3) -----		
Silica (SiO_2) -----	131	4.34
	1,012.8	-----

Stone Breaker Hot Springs. These springs are 8 miles southeast of Bieber, in Big Valley. There are six pools and springs in a belt extending 275 yards in a southerly direction; about 250 yards east there are four other hot pools. The highest temperature recorded was 165° F. Flow from the hottest spring is 125 gallons per minute. The hot water rises from a tuffaceous sandstone.

Mud Springs. There are extensive hot mud springs situated about 15 miles northeast of Honey Lake.

MODOC COUNTY.

By W. BURLING TUCKER, Field Assistant.

Field Work in August, 1915.

DESCRIPTION.

Modoc County, situated in the northeastern part of the state, is bounded on the south by Lassen County, on the west by Siskiyou, on the north by the state of Oregon, and on the east by the state of Nevada.

Modoc County has an area of 3823 square miles. It is a succession of valleys, that in the past were inland lakes, and which follow one another through the country from north to south. In the northern end of the county are notable Goose Lake, Tule Lake, and the three lakes of Surprise Valley. These valleys are separated by low volcanic ridges, being bordered by bluffs of volcanic rocks.

The lava flows, with which the county is to a large extent covered, evidently had their source from Lassen Butte in the southern part of the county, and the peaks in the Warner Range for the northern flows. Probably some of the flows emanated from Mount Shasta to the west.

The Warner Range of mountains which divides the Goose Lake country from the Surprise Valley section, attains in several places a height of over eight thousand feet. This range is a branch of the Sierra Nevada Mountains.

Pit River, one of the main sources of the Upper Sacramento River, takes its rise in this county and, with its tributaries, supplies the county fairly well with water. It starts from some large springs below the south end of Goose Lake. This river drains all the country west of the Warner Range of mountains. The most productive areas agriculturally are Round, Stone Coal, Hot Springs, Goose Lake and Surprise valleys. Round Valley has a diameter of eight miles, surrounded by eruptive hills, and is largely devoted to grain raising. This valley gets its water supply from Rush Creek. Stone Coal Valley is twelve miles long by one mile wide. This valley, surrounded with low-lying, well-timbered hills covered with good pine timber, is named from a strata of coal which occurs along Stone Coal Creek in exposures of shale. Hot Springs Valley is twenty-five miles long and four miles wide, deriving its name from a number of hot springs that rise in the valley. Alturas, the county seat, is at the junction of the three valleys—Goose Lake, South Fork and Hot Springs. Surprise Valley lies to the east of Warner Range and is sixty miles long and about six miles wide. It has, at one time, been

an inland sea. At present it contains three lakes—the Upper, Middle and Lower lakes, the waters of which are strongly alkaline. On the east side of these lakes to the state line the country is all desert. The town of Cedarville lies east of Middle Lake. At the head of Upper Lake, Mount Bidwell rises to a height of 8450 feet; at its foot is the town of Fort Bidwell. The largest sheet of water is Goose Lake, which is 45 miles long and eight miles wide and has a depth of about twenty feet.

The principal industry of the county is stock raising. Owing to the heavy flow of lava over a large part of its area, only two mineral belts have been developed in the county; the High Grade District, located in the Warner Range of mountains in the northeastern part of the county, near the state of Oregon boundary line, and the Winters District, situated in the southern part of the county, a few miles north of the Lassen County line.

RAILROAD FACILITIES.

The Nevada-California-Oregon Railroad traverses the entire length of the east side of the county, commencing at Reno, Nevada, and ending at Lakeview, Oregon. From the principal stations on this railroad the remote parts of the county are reached over good wagon roads.

Among the known mineral resources of Modoc County are: clay, coal, copper, gold, iron, quicksilver, salt and silver.

MODOC COUNTY—Table of Mineral Production.

Year	Gold, value	Silver, value	Salt		Stone industry, value	Other minerals, value
			Tons	Value		
1880	\$10,000					
1881	20,000	\$1,500				
1882						
1883	50,000					
1884	60,000					
1885	60,000					
1886*						
1910	5,438	75				
1911	19,875	363				
1912	27,893	494	50	\$800		
1913	6,061	94	40	720		
1914	1,000	10	40	720		
1915	7,557	104	†	†	\$300	\$720
Totals	\$267,824	\$2,640	130	\$2,240	\$300	\$720

Total mineral production, Modoc County, 1880-1915 (incl.)

Gold	\$237,824
Silver	2,640
Salt	2,240
Stone industry	300
Other minerals	720
Total	\$273,724

*1886 to 1910 no mineral production.

†Combined under "Other minerals."

COAL.

In Stone Coal Valley along the creek of that name in the exposure of shales there is a stratum of lignite coal which has a strike of N. 65° W., and a dip of 25° N. Only a small amount of development has been done on this coal.

COPPER.

On the east slope of a spur of the Warner Range, about seven miles south of Fort Bidwell, some very promising indications of copper have been discovered, but owing to the remoteness of the district from railway transportation, only a small amount of development and prospecting has been done on the properties.

Seitz Copper Mine. It is situated seven miles south of Fort Bidwell, and 25 miles SE. of Willow Ranch Station on the Nevada-California-Oregon Railroad. The claims are located on the east slope of a spur of the Warner Range, at an elevation of 5860 feet. Holdings consist of six claims: Little Ben, Josiah, Christy, Dream, Charity, and Blue Jay, giving 3000 feet on the lode. A series of narrow veins occur in a porphyritic andesite, and have a general strike of N. 65° E., dipping 60° SE. Developments consist of shaft 90 feet deep and a tunnel 336 feet long, which connects with bottom of the shaft. The ores developed carry cuprite, malachite, azurite, and some native copper. A large number of shallow open cuts have been made on the different veins which have a width of two inches to eight inches—some high grade ore has been shipped from this property. Two men are employed. Mrs. W. B. Yonkin and W. B. Seitz of Fort Bidwell, owners.

GOLD.

HIGH GRADE MINING DISTRICT.

In the following description the writer has drawn freely on a report of this district by James M. Hill of the United States Geological Survey.

Location.

The High Grade District is located in the extreme northeast corner of the county, in the Warner Mountains. Its northern boundary is the Oregon line; its eastern boundary is about seven miles west of the Nevada-California line, and its western boundary is Goose Lake Valley.

History of Mining in this District.

The discovery of gold in the High Grade camp was made on the Oregon claim at the south end of the district in 1905 by a sheep herder, who sold to J. O. Kafader, of Fort Bidwell. The first real boom took place in the summer of 1905, but the autumn of 1909 and the spring of 1910 witnessed the big rush to the district.

Accessibility.

Fairport, on the Nevada-California-Oregon Railway, is ten miles west of the district, and it, with the town of New Pine Creek, Oregon, which is a mile off this road, is the supply point for the mines. The roads from Fairport to High Grade are steep but good.

Timber and Water.

High Grade is plentifully supplied with timber and water for mining purposes.

Topography.

The Warner Mountains in the vicinity of High Grade are rugged, but have a fairly even crest at an elevation of 7500 feet. Mount Bidwell, about three miles southeast of the camp, attains an elevation of 8550 feet. The west front of the range has an abrupt rise of 1000 feet above the level floor of Goose Lake Valley, which is about 5000 feet above sea level. This rise is along a fault which follows the east side of the valley for some distance. The cañon cut by Pine Creek, which is followed by the High Grade road, has very steep sides. The east front of the Warner Mountains has also a very abrupt rise. The mines in the High Grade district are located along the summit of the range at the headwaters of New Pine Creek. The most prominent peak on this divide is Yellow Mountain, which has an elevation of 8000 feet.

Geology.

In the High Grade district there are four distinct types of extrusive lavas. The oldest rock exposed along the lower western side of the district is a dark grained andesite; above this is a white to yellow rhyolite. Above this rhyolite on the flat eastward slope of Alturas ridge there is a purplish flow rhyolite with very fine lamellae. A fresh porphyritic augite basalt is exposed on the west flanks of Mount Bidwell.

The andesite which covers the western part of the district is composed of dark-gray to green flows, dipping east at low angles. On the ridge about two miles west-northwest of High Grade the yellowish rhyolite overlies the andesite. This contact is again seen about 400 feet below the summit of Discovery Hill, at an elevation of 7700 feet. The rhyolite that forms all of Yellow Mountain and High Grade Hill, and the northern part of Discovery Hill, is white, but weathers yellow.

On Alturas Ridge there is a small area of thinly laminated purple rhyolite. The augite basalt on the west flank of Mount Bidwell is perfectly fresh greenish-black porphyry that weathers dull brown.

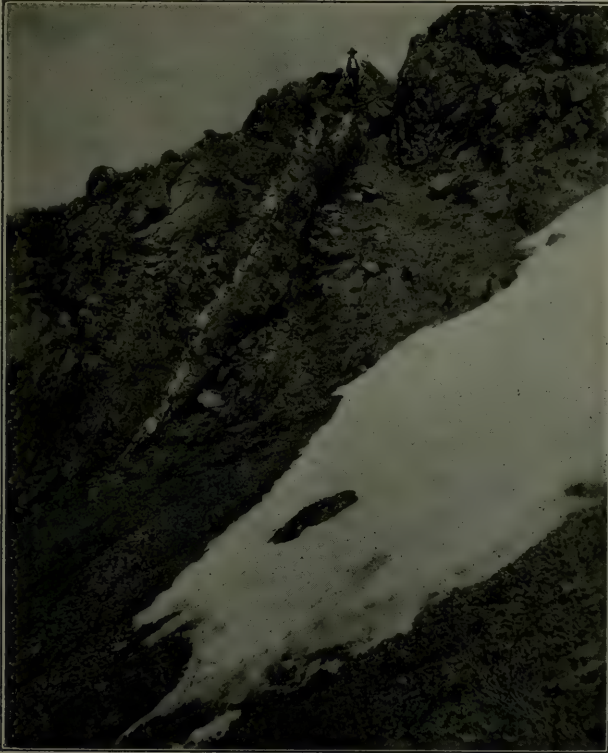
Ore Deposits.

There are three distinct types of ore deposits in the High Grade district. (1) Veins in granular rhyolite with some replacements of the walls. (2) Veins in andesite. (3) Veins and replacements in

glassy rhyolite. The veins in the granular rhyolite yield the largest amount of ore.

The principal veins occur in nearly east-west vertical fissures, and also to some extent in north-south and northwest-southeast fractures.

In practically all the veins post mineral movements have in places crushed the ore and produced gouge, which, though seen in places between the walls and vein quartz, is commonly found in the quartz where the wall rock was too tough to fracture. The clay gouge of almost every vein constitutes the richest ore.



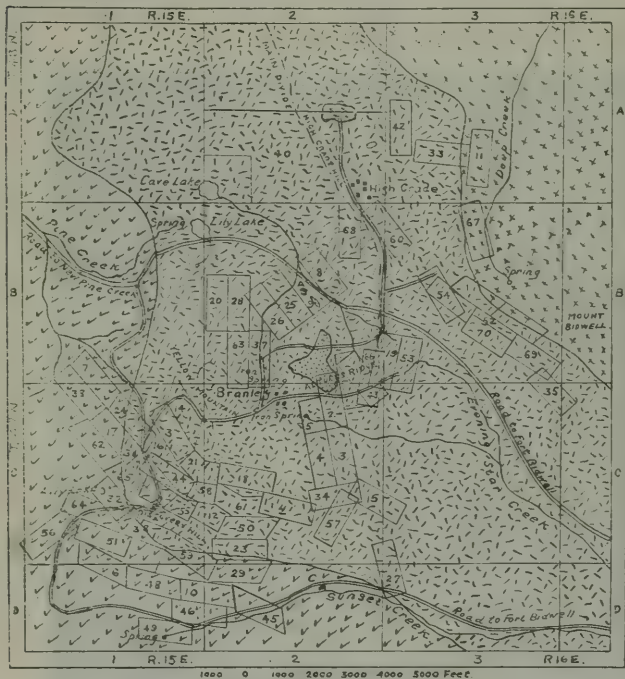
Outcrop of discovery vein on Oregon Claim, High Grade.

The veins in granular rhyolite are found on High Grade Hill, on Alturas Ridge, and the north side of Discovery Hill. In all these places the granular rhyolite has been more or less silicified, particularly along zones of brecciation, the result being that the rock has become particularly hard.

On High Grade and Discovery Hills this hard altered rhyolite has weathered into so-called "rock piles." In these veins the best ore occurs in shoots which pitch east or southeast on the veins at medium angles.

The veins in andesite are confined mostly to the south side of Discovery Hill. The andesite is cut by a number of small white

U.S. GEOLOGICAL SURVEY.



- MINES
Names of Mines.
1. Alaska Bell
 2. Alturas
 3. " No. 1
 4. " No. 2
 5. " No. 3
 6. Apache
 7. " No. 4
 8. " No. 5
 9. " No. 6
 10. " No. 7
 11. " No. 8
 12. " No. 9
 13. " No. 10
 14. " No. 11
 15. " No. 12
 16. " No. 13
 17. " No. 14
 18. " No. 15
 19. " No. 16
 20. " No. 17
 21. " No. 18
 22. " No. 19
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 60. " No. 57
 61. " No. 58
 62. " No. 59
 63. " No. 60
 64. " No. 61
 65. " No. 62
 66. " No. 63
 67. " No. 64
 68. " No. 65
 69. " No. 66
 70. " No. 67
 71. " No. 68



Basalt



Glassy rhyolite



Rhyolite



Andesite



Mill

SKETCH MAP OF HIGH GRADE MINING DISTRICT.

- A. Big Four
B. Consolidated
C. Custom.

quartz stringers, which strike west-northwest and east-northeast, and which in some places unite to form fair sized veins, as on the North Star, Oregon and Sunset claims. Most of the larger veins strike about N. 60° W. and dip 70° to 75° S. Post mineral movement has formed gouge along the walls, and in some places has crushed the veins.

The veins in the glassy rhyolite occur on Alturas Ridge, where the Alturas shaft has been sunk on a north and south fracture in glassy rhyolite; the fissure is quite tight and shows some pyrite.

MINES.

Alturas Mines (quartz). See Bulletin 594, U. S. G. S., p. 47. They are situated on the north slope of Alturas Ridge, nine miles east of New Pine Creek, Oregon. Holdings consist of the following claims: Alturas No. 1, No. 2, No. 4, Little Fawn, and Alturas Triangle. A vertical shaft has been sunk on a north and south fracture to a depth of 125 feet. This fracture cuts a glassy flow rhyolite. Pyrite has been deposited as the matrix of the breccia together with bluish, white and amethystine quartz. Idle. Alturas Gold Mining Company, owner. C. W. Canfield, Oakland, Cal., manager.

Bidwell Discovery Mines. See Bulletin 594, U. S. G. S., p. 46. These mines are situated on the south slope of Discovery Hill, about eight miles NW. of Fort Bidwell. Claims are as follows: Oregon, California, Gold Wedge, Archerton, Hardtack and Nine-thirty, with 4400 feet on the lode. The veins on these claims occur in the andesite. The Oregon-California vein strikes N. 60° W. and dips 20° S. Width of four inches to one foot. It consists of white quartz stained with limonite, and in some places stained with a green copper silicate. The vein stands out distinctly against the dark andesite walls. Developments consist of a tunnel which crosscuts the vein 150 feet from portal, with a drift west on the vein 150 feet, and east 170 feet.

In the west drift, a crosscut was driven south 80 feet cutting a parallel vein which was drifted on forty feet west, showing four to eight inches of quartz. The occurrence of the gold is very fine and can not be seen in the quartz. There is a Kendall 1-stamp mill on the property. Two men are employed. Bidwell Discovery Gold Mining Co., Fort Bidwell, Cal., owner. C. D. Kafader, president. J. O. Kafader, secretary and manager.

Big Four Mine. It is situated eight miles east of New Pine Creek, Oregon, on the Fairport and High Grade road. Claims: Big Bonanza, Bonanza King, Golden Treasure, and Golden Knight, with 3000 feet on the lode.

On the property there is a massive outcrop of highly silicified rhyolite, which strikes N. 60° E. This outcrop carries values for a width of 150 feet. An incline shaft has been sunk 100 feet on a N. 30° W. vein, which dips 70° NE. This vein varies in width from two inches to two feet, and cuts granular rhyolite. The ore consists of rhyolite and quartz in a clay matrix. The vein was drifted on both north and south on the 30' and 40' levels. Ore is being mined from the silicified outcrop by means of a surface open cut. The ore is hauled from open cut in dump carts to mill, where it is crushed by five stamps, weighing 1000 lbs. dropping 105 per minute, and crushing two tons per stamp through a 60-mesh screen. The pulp from

battery flows over amalgamating plates 18 feet long by 5 feet wide and which have a slope of $2\frac{1}{2}$ inches per foot. The mill is driven by steam power. Six men are employed. The property is under lease to C. W. Tyler and Carl Monsees. Big Four Mining Company, Alturas, Cal., owner.

Eugene Mine. This mine is situated on the east slope of Discovery Hill, nine miles east of New Pine Creek, Oregon. Here is a series of east and west fractures in rhyolite. Developments consist of a tunnel 270 feet in length and a series of shallow open cuts. Idle. Richard Mason et al., of High Grade, owners.

Fern Mine. It is situated on the east slope of Alturas Ridge, nine miles east of New Pine Creek, Ore. Holdings: Fern Fraction, Fairport No. 1, No. 2 and No. 3. The vein has a course of N. 70° W., dips 80° S. It varies in width from 2" to 12". The fracture is filled with brecciated country rock cemented with quartz. Developments consist of shaft 40 feet deep and a series of shallow open cuts. Idle. Fairport Merger Gold Mining Co., New Pine Creek, Ore., owners.

Fort Bidwell Consolidated Mines. See U. S. G. S. Bulletin 594, p. 46. These mines are situated on the north side of Discovery Hill, about eight miles east of New Pine Creek, Oregon. Holdings consist of the following claims: Mountain View, Sugar Pine, Missing Link, Diamond Fraction, Old Glory and Valley View, with 2650 feet on the lode. The developments have been on the Mountain View and Sugar Pine claims. The vein on the Mountain View strikes N. 70° W. and dips 75° S. This vein cuts the rhyolite and the underlying andesite. Some very high grade ore is reported to have been extracted from a winze, where the ore occurred on the hanging wall in a heavy iron-stained gouge. Some of the vein quartz shows a copper silicate stain. On the Mountain View claim, a crosscut tunnel has been driven 150 feet to vein, with a drift east 250 feet on the vein.

Two shoots of ore were developed, one being 40 feet in length, and the other 50 feet long. At intersection of crosscut tunnel, and drift, a winze was sunk on the vein to a depth of 75 feet. About 100 feet east of this winze, a second winze was sunk to a depth of 35 feet. The vein on the Sugar Pine strikes N. 80° W., and dips 60° to 70° S. The vein ranges in width from 4" to 5', and consists of partly brecciated rhyolite. Throughout the vein there is considerable iron-stained clay that is reported to carry gold values. The walls of this vein are stained with a heavy coating of limonite and some hematite. The wall rock for two feet on either side of the vein is a low grade ore. The Sugar Pine vein has been developed and worked from three tunnels driven on the vein: No. 1 Tunnel (lower) 350' long; No. 2 Tunnel, which is 70' above No. 1, has a length of 200'; No. 3 Tunnel is

40' above No. 2 and is 90' long. The ore has been stoped out from No. 1 to No. 3 Tunnel for a length of 75 feet. It was trammed from No. 1 Tunnel to bins, from which it was transported by an aerial tramway over ridge to ten-stamp mill on the Mountain View claim, a distance of 3200 feet. Idle. Fort Bidwell Consolidated Mining Company, Hodges Building, Detroit, Mich., owner.

Gold Peak and Klondike Mines. They are situated nine miles east of New Pine Creek, Oregon, on the north slope of Discovery Hill. The vein varies in width from 2" to 12"; strikes N. 70° W. and dips 30° S. The developments consist of a series of shallow shafts and tunnels. Idle. J. T. Maupin, E. Coshes et al., Fort Bidwell, Cal., owners.

Gold Shore Mine. This mine is situated nine miles E. of New Pine Creek, Oregon, on High Grade Ridge. Holdings consist of four claims—Daisy, Inner Fraction, New Year and Gold Shore. The main fissure strikes N. 60° W. and dips 80° S.; and varies in width from 2" to 5'. Developments: shaft 26 feet deep sunk on the vein, which shows five feet of vein material. A crosscut tunnel 250 feet long was driven to cut the above vein, but owing to displacement of the vein, it was not found on the tunnel level. Idle. Gold Shore Mining Co., New Pine Creek, Ore., owner.

Last Dollar Mine. It is situated nine miles E. of New Pine Creek, Oregon, on the west slope of High Grade Hill. Vein strikes N. 75° E. and dips 80° S. Width twelve inches. Shaft 45 feet deep sunk on the vein. Idle. E. T. Weisendanger of Los Angeles, owner.

Modoc Mine. See U. S. G. S. Bulletin 594, p. 45, by James M. Hill. It is situated nine miles E. of New Pine Creek, Oregon, on the crest of High Grade Hill. Holdings consist of 259 acres of patented land in Sec. 36, T. 48 N., R. 15 E. The main shaft was sunk to 50 ft. level on a vertical fracture that strikes N. 70° E. in a silicified fault breccia. The fissure is three inches to fifteen inches in width, with a clay gouge on both walls. The highest grade ore developed in this property is a soft heavily iron-stained breccia of wall rock and quartz with a clay gouge between the central band of quartz and the walls of the vein. In this ore the matrix of the breccia has been partly leached. The wall rock is somewhat iron-stained for several feet from the vein, with numerous quartz stringers running through it in all directions. Developments: The east shaft which is the main vertical shaft, has been sunk to a vertical depth of 212 feet. At a point 180 feet west of main shaft, an air shaft was sunk to a vertical depth of 125 feet, intersecting the workings from main shaft on the 50' and 100' levels. Drifts have been driven east and west on the vein on the 50',

100' and 200' levels. On the 50' level there is a drift west 240', and 79' east. On the 100' level, drift 365' west and 15' east. On the 200' level, drift 275' west and 66' east. The 200' level was driven on a mud seam, and at a point 230' SW. of shaft a vein having a strike of N. 70° E. and dipping 80° S was cut. About 90' SW. of west shaft a winze was sunk to a depth of 50' on an intersection of three fractures, and a vein having a course of N. 70° E. and dipping 85° S. This vein varies in a width from 6" to 18". The vein filling is a white quartz with clay gouge on both walls. In a crosscut south of winze on the 100 ft. level a crushed zone 25 ft. in width was cut, which is highly mineralized with pyrite, and strikes N. 25° W. Twenty men



Shaft house and ore bins, Modoc Mines Company. High Grade mining district.

are employed. Modoc Mines Company, Kestner Bldg., Chicago, Ill., owner. William Wrigley, Jr., president. N. E. Guyot, manager.

Morning Star Mine. It is nine miles east of New Pine Creek, Oregon, on the east slope of High Grade Hill. Claims: Morning Star and Snowdrift. Two veins have been developed—the Morning Star vein strikes N. 30° E. and dips 70° W.; the Snowdrift vein has a N.-S. course with a dip of 80° W. Developments: Shaft 60 ft. deep and a tunnel 200 ft. in length. Two men employed. J. E. Dunnavin and Frakes Brothers, owners.

Mountain Summit and Quartzite Mines. They are situated eight miles east of New Pine Creek, Oregon. On Mountain Summit claim there is a shaft 50 feet deep, sunk on N. 70° W. fissure. Two shafts have been sunk on the Quartzite claim to the depth of 50 feet, with a

small amount of drifting from each shaft. Idle. J. O. Kafader et al., of Fort Bidwell, owners.

Mountain Sheep Mine. It is situated nine miles east of New Pine Creek, Oregon, on the east slope of Alturas Ridge. The vein strikes N. 70° W. and dips 75° S. It varies in width from 2" to 2'. Developments: Tunnel 90' long, and a series of shallow shafts from 25' to 50' deep. Idle. Fleming Bros. of New Pine Creek, Oregon, and Jamison and Wylie, of Alturas, Cal., owners.

North Star Mine. It is situated eight miles NW. of Fort Bidwell, on the south slope of Discovery Hill. There are two narrow quartz veins on this property, striking N. 70° W. and dipping 75° S. Developments: Upper tunnel crosscut the vein 78 ft. from portal, with a drift 30 ft. west on vein. About 200 feet below this crosscut a tunnel has been driven 42 feet to vein, which has been drifted on 190 feet west. One man employed. J. T. Maupin and G. F. Maupin of Fort Bidwell, Cal., owners.

Shasta View Mine. It is situated 8 miles east of New Pine Creek, Oregon, on the west slope of Discovery Hill. This property has been worked through the Mountain View tunnel. At a point 90 feet east of the crosscut tunnel on the Mountain View claim, a crosscut has been driven southwest 138 feet to the Shasta View vein, that strikes N. 80° W., with a dip of 80° S., and a drift has been driven east on the vein 75 feet. This vein cuts both the granular rhyolite and the underlying andesite, and varies in width from 2" to 15". The vein shows crystallized quartz and clay gouge; at places it is copper stained. Idle. Richard Mason and G. F. Maupin of Fort Bidwell, Cal., owners.

Sunset Mine. It is situated 8 miles northwest of Fort Bidwell on the south slope of Discovery Hill. The Sunset vein cuts both the granular rhyolite and the underlying andesite. The vein has a strike of N. 60° W. and dips 75° S. It varies in width from 2" to 2'. In the rhyolite it contains the typical brecciated quartz cemented ore, but in the andesite it consists of white quartz. It is developed by a series of open cuts, and a shaft 65 feet deep, also by a long tunnel lower down on the hill, which has over 800 feet of crosscuts and drifts. This tunnel, which has been driven in the andesite, has not developed any pay ore. Two men are employed sinking a shaft on the crest of Discovery Hill. J. N. Van Coughnet, E. McCoughrey et al., of Fort Bidwell, Cal., owners.

Sunshine-High Grade Gold Mines. They are situated on High Grade Hill, about 9 miles east of New Pine Creek, Oregon. Claims: Sunshine, Yellow Jacket, and Gascow Fraction. On the Sunshine

claim a shaft has been sunk to a depth of 60 feet on a narrow open fissure which strikes N. 75° W. and dips 85° S. The vein varies from 2" to 8" in width, and cuts a silicified rhyolite, which shows only slight brecciation. The richest ore from this vein is a mixture of brownish-colored clay gouge and quartz. A tunnel 300 feet long has been driven on this vein, connecting with the shaft about 150 feet from portal. From the tunnel level two winzes have been sunk to a



Sunshine tunnel, High Grade mining district, showing typical "rock piles" of High Grade Hill.

depth of 50 feet on the vein. The north end of the Yellow Jacket claim is underlain by a silicified rhyolite breccia, in which there are a number of fractures that strike N. 75° W. The ore on this claim consists of a hard, silicified breccia. A shaft has been sunk to a depth of 70 feet on one of these fractures. Idle. Sunshine-High Grade Gold Mining Co., owner; Felix Green, president; J. S. Taylor, secretary, New Pine Creek, Ore.

Tamarack Mine. It is situated on the east slope of Discovery Hill, about 8 miles northwest of Fort Bidwell. Developments consist of a crosscut tunnel 130 feet in length, and a series of shallow shafts and open cuts. Idle. A. C. Lowell of Fort Bidwell, owner.

White Quartz (Red Quartz, Evening Star and Klondike) Group of Mines. These properties are situated on east slope of Alturas ridge, about 9 miles east of New Pine Creek, Oregon. On these claims there are a series of parallel north and south fractures cutting a granular rhyolite. Developments consist of a series of shallow shafts and open cuts. Idle. W. D. Broaddus and J. E. Dunnavin of Fort Bidwell, owners.

WINTERS MINING DISTRICT.

The Winters Mining District is about 35 miles west-southwest of Alturas, 16 miles north of Adin, and $3\frac{1}{2}$ miles south of Pit River. It lies on the southwest of Scheffer Mountain just east of the Adin-Alturas road. The only developed property in this district is the Hess Mine.

Geology.

This district lies in the great area of volcanic rocks which covers so much of northeastern California. The rocks in the vicinity of the mines are porphyritic.

Ore Deposits.

The ore deposits strike west-northwest in a zone of slight displacement along which the flows north of the fault zone have been raised with relation to those south of it. This zone has been traced for about 2 miles east and west and is scarcely more than one-half mile wide. The brecciated country rock is associated with all the ore mined. The vein filling consists of quartz and calcite, the former largely replacing the latter.

MINES.

Dixie Queen Mines. They are 16 miles north of Adin, and lie east of the Hess Mine. Developments consist of a crosscut tunnel 300 ft. long and a series of shallow shafts and open cuts on the vein. The vein has a general E.-W. strike and dips 50° S. Idle. Dixie Queen Mining Co., Los Angeles, Cal., owner.

Hess Mine. It is 16 miles north of Adin on a ridge southwest of Scheffer Mountain, and about one-fourth of a mile east of the Adin-Alturas road, at the head of the south fork of Stone Coal Creek. The Hess vein strikes E. and dips about 50° S. and has a width of 4' to 6'. It occurs along a zone of faulting, which has produced a breccia of basalt 4' to 12' wide, consisting of quartz, calcite and adularia cementing fragments of the wall rock. An incline shaft 300 feet deep has been sunk on the vein, and levels driven on the vein at 120', 150', 200' and 250'. On the 120' level the vein has been drifted east 100' and west 65'. On the 150' level there is a drift 25' west and 140' east. The 200' level has been extended 150' east. There is a drift 250' west and 170' east on the 250' level. The ore shoot developed was 80' long at the surface; at the 120' level 150' long, and at the 150' level it is 65' long. On the 200' and 250' levels this ore shoot is about 100' long. The richest ore occurred along footwall of vein. The incline shaft cuts a fault on the 200' level, the vein being faulted to the south. The length of throw has not been determined. The strike of this fault is N. 15° W. with a dip to the east. On the 250' level this fault was

picked up 40' east of shaft. No ore has been developed west of fault. About 550' east of main incline a vertical shaft has been sunk to a depth of 110'. This shaft was sunk for main working shaft, but operations were suspended before its completion.



Hess mine and mill, Winters Mining District, Modoc County.

Mill: A 6" x 8" Dodge crusher. Ten stamps weighing 500 lbs. each. A 20-ton cyanide plant. The gold which occurs in very fine particles is said to be hard to save by amalgamation, but good results were obtained by cyanidation. Two men employed on development work. Hess Gold Mines Co., owner; F. M. Jamison, president; A. K. Wylie, secretary. Alturas, Cal.

Modoc-Mammoth Mines. They are situated 16 miles north of Adin, on ridge east of Stone Coal Valley. Several shafts were sunk on these claims but no ore was developed. Idle. Modoc-Mammoth Gold Mining and Milling Co., owner; F. M. Jamison, president; Dennis Kane, secretary. Alturas, Cal.

MINERAL SPRINGS.

Throughout Modoc County there are a number of hot and warm springs which are of deep-seated origin. The waters of these springs are used extensively for domestic and irrigation purposes. As a rule the waters from these springs have no distinct odor or taste, and are only slightly mineralized of an alkaline type. The following enumerated springs have been described in the "Water Supply Paper 338, on Springs of California," by Gerald A. Waring of the United States Geological Survey:

Allen Warm Springs. These springs are situated 9 miles west of Alturas on the Alturas and Adin road. The water is only slightly mineralized, of an alkaline type. The flow is approximately at the rate of 275 gallons per minute. Temperature being about 81° F. The water is employed for domestic uses as well as for irrigation.

Bottle Spring. It is about 10 miles south of Pothole Spring, and near the northern end of Fairchild Meadow. It yields cold water, and the amount is said to vary greatly with the season.

Boyd Spring. It is situated near the eastern side of Upper Lake in Surprise Valley. Temperature of water is about 67° F. Used for irrigation purposes.

Kelley's Hot Spring. It is located on the Alturas and Adin road about 20 miles west of Alturas, or 4 miles northwest of Canby. A pool about 12 yards in diameter has been formed in a semicircular depression in the alluvium of the northern side of Pit River Valley. In the center of this pool the water boils up with such force as to dome up about one foot high. It discharges about 325 gallons per minute. Temperature of 204° F. The water has no distinctly mineralized taste, though it is said to stimulate the action of the kidneys.

Pothole Spring. This spring is situated in a small marshy area at the western base of Blue Mountain, about 35 miles northwest of Alturas. The water rises in a deep clear pool a few feet in diameter, and is noticeably above normal temperature, but probably less than 70° F. The flow from this spring is small.

A number of springs occur in this county that have no designated names, and their locations will be herewith described as follows:

About 8 miles north of east from Kelley's Hot Spring a stream named **Hot Creek** is formed by a number of hot springs that rise on the north side of the valley that borders Pit River. Near the head of **Cañon Creek**, south of the valley of Pit River, are a number of warm springs. On the west side of the cañon of **Bidwell Creek**, about a mile north of Fort Bidwell, are a number of hot springs whose temperature ranges from 90° to 110° F. At points about 2 and 3 miles, respectively, north of **Lake City**, hot water rises in the meadow land that borders Upper Lake. Between Upper and Middle lakes, on the east side of **Surprise Valley**, are three small hot springs.

SALT.

The **Surprise Valley Salt Works**, S. S. and E. H. Buck, Cedarville, produce a small tonnage of salt annually by solar evaporation of the alkaline lake waters there.

SUTTER COUNTY.

By CLARENCE A. WARING, Field Assistant.

Field Work in December, 1916.

Sutter County lies just north of Sacramento County, California, mainly between the Sacramento and Feather rivers. It is bounded on the east by Yuba and Placer counties, on the west by Colusa and Yolo counties and on the north by Butte County. The county includes an area of 611 square miles, supporting a population in 1910 of 6328 persons. The assessed valuation of the county in 1916 was \$13,472,178. It was named in honor of the distinguished pioneer, General John A. Sutter. Yuba City, the county seat and largest town, had a population exceeding 1600 in 1914.

The county is excellently provided with transportation. The Feather and Sacramento rivers are navigable by small craft all the way to



Photo No. 15.—View of Marysville Buttes, Sutter County, from the southeast. Photo by Walter W. Bradley.

Sacramento. The main Southern Pacific Railroad from San Francisco to Portland enters the county near Yuba City and passes northwestward through Lomo and Live Oak. The Northern Electric (Colusa Branch) Railroad crosses the county from east to west through Yuba City and northward from the same place. The Northern California Railway (S. P. Co.), enters the southern end of the county and follows the west side of Feather River northward to Yuba City. The Northern Electric and Western Pacific Railways cross the southeastern portion of the county, from north to south, west of Pleasant Grove. The county is well served by wagon roads.

Power lines of the Pacific Gas and Electric Company and Oro Electric Corporation, practically surround the county and cross its southern end. Electricity is thus available for both power and lighting purposes in practically every part of the county.

The north central portion of the county is marked by the Sutter or Marysville Buttes, the South Butte of which is 2128 ft. in elevation.

The Buttes occupy a circular area about 10 miles in diameter, but strips about 2 miles wide along the more gentle eastern and western slopes are cultivable. The remainder of the county consists of lowland with a gentle southwesterly slope, a great portion of which is capable of producing a wide range of crops. Considerable of the western portion of the county consists of low tule land capable of being reclaimed.

GEOLOGY.

The geology of Sutter County has been covered in considerable detail by H. W. Turner,¹ and W. Lindgren.^{1, 2} Paleontological papers describing the Eocene formation of the Marysville Buttes have been written by W. L. Watts,³ J. G. Cooper,⁴ and R. E. Dickerson.⁵

Aside from the Buttes, Sutter County is covered with deep alluvial soil. The Buttes consist of a core of andesite surrounded by upturned Eocene sedimentary strata overlain by andesite tuff and breccia. The sedimentary strata have been shown to be of Eocene age and were tilted in all directions from the center of the Buttes when the andesite intrusion took place. The andesite core has later been broken through in places by rhyolite.

MINERAL RESOURCES.

Sutter County has to date been but a slight mineral producer, although a few metals such as gold, silver and quicksilver have occasionally been found in the Marysville Buttes. No systematic work has been undertaken since the results of prospective work have not warranted it. Coal, clay and natural gas have also been found, but little has been done with them. It is reported that rock in the Buttes suitable for road metal is being crushed and used by the road supervisors. The only commercial mineral production in Sutter County, noted in the statistical records of the State Mining Bureau, was: Macadam, \$5,000 in 1908. There was some also in 1916, but the amount is not to hand at this writing.

¹U. S. Geol. Surv. Folio No. 17, Marysville, 1895.

²U. S. Geol. Surv. Prof. Paper No. 73, pp. 23-25, 1911.

³Calif. State Min. Bur. Bull. 3, pp. 9-10, 1894.

⁴Calif. State Min. Bur. Bull. 4, pp. 36-45, 1894.

⁵Bull. Dept. of Geol., Univ. of Calif., Vol. 7, No. 12, pp. 257-298, pls. 11-14, April, 1913.

CLAY.

Clay beds of considerable extent occur in the sedimentary Eocene strata of the Marysville Buttes. These should be available for the manufacture of brick and pottery.

COAL.

Thin seams of lignite occur in certain of the beds of the Ione formation in the Marysville Buttes. It is reported to have been found in the South Butte Valley and 3 miles south of Pennington and also in a 35-ft. well south of Sutter City. The beds lie above strata of clay and are overlain by gravelly sand. The coal is probably of too poor quality to be of economic importance.

GOLD.

No gold-bearing quartz veins have been found in the Marysville Buttes, but certain coarse gravels occurring in the sedimentary Ione strata have been found to be auriferous. The volcanic mud-flows containing gravel have also been found slightly auriferous. The gravels consist of waterworn pebbles of quartz, metamorphic sedimentary rock, diabase, granite and serpentine, and no doubt were carried from the Sierra Nevada by rivers.

The gulches and ravines in certain localities have been washed during the rainy season and fine, well-rounded gold recovered. An occasional large piece of gold, worth as high as five dollars, is found.

NATURAL GAS.

Small quantities of gas have been encountered in wells, drilled for water, at Yuba City. Since none of the wells penetrated below 200 ft. they probably did not reach any gas-bearing sedimentary strata underlying the alluvium. A 20-ft. well, drilled in 1864 about 1 mile southwest of South Butte, in Ione, clay and sandstone is reported to have yielded a small flow of natural gas. A second well reported to have been drilled, in 1892 close to the first one, struck no gas and ran into massive eruptive rock.

The Ione strata appear to carry natural gas throughout the region and in certain localities may be found to yield a commercial supply. Such localities will probably not be found in the immediate vicinity of the buttes but sufficiently remote where undisturbed strata may be penetrated.

LIMESTONE.

An impure gray limestone is reported to occur, just south of South Butte, in beds of the Ione formation which lie in a nearly vertical position. A tufa (spring deposit) consisting principally of calcite is

reported to occur in an area of volcanic tuffs about 1000 ft. south of the South Pass road, $1\frac{1}{2}$ miles south-southeast of the South Butte.

These lime deposits should be valuable as a natural binding material for road metal.

STONE.

A quarry in the rhyolite rock 3 miles northwest of Sutter City, has furnished some building stone which was used locally.

It is reported that the county supervisors are at present using crushed rock from the Buttes for road metal. The volcanic rocks should furnish an excellent material for roads and the supply is easy of access and unlimited.

TEHAMA COUNTY.

By W. BURLING TUCKER, Field Assistant.

Field Work in September, 1915.

DESCRIPTION.

Tehama County is situated in the upper part of the Sacramento Valley. It extends east to the summit of the Sierras, on the west to the crest of the Coast Range Mountains. The county itself comprises an area of 2893 square miles and is about evenly divided on both sides of the Sacramento River. For nearly 50 miles this river wends its way through the center of the county.

Rising in the Sierra Nevadas and flowing westward into the Sacramento River are Los Molinos River, Deer, Antelope, Paynes, and Battle creeks—all perennial streams, and supplying unlimited water for irrigation purposes.

Starting in the Coast Range Mountains and running eastward into the Sacramento River are Cottonwood, Elder, and Toms creeks. The town of Red Bluff, the county seat, lies at the head of river navigation on the Sacramento. The county comprises valley, foothill, and mountain lands, used principally for agricultural, horticultural, and grazing purposes.

The eastern and western portions of the county are covered with extensive growths of fine timber, the lumber industry being an important source of revenue.

GEOLOGY.

The eastern half of the county is covered with sheets of lava, which had their origin from and around Lassen Peak. The central part of the county shows an extended plateau of gravels, sands and clays, which extend to the serpentines and metamorphic rocks of the Coast Range.

MINING.

Little mining is being done in this county at present. Chromic iron, indications of oil, coal, copper and manganese occur in the western part of the county. Some development work has been done on the chrome deposits which occur in a belt of serpentine, near the western boundary of the county in the Coast Range Mountains.

About 10 miles west of Paskenta some promising prospects of manganese ore are being opened up.

Mineral springs are abundant throughout the county, some of which are widely known for their medical purposes, the most noted being Tuscan Springs, near Red Bluff.

MINERAL RESOURCES.

Among the mineral resources of the county are: brick, chromite, copper, gold, manganese, marble, mineral water, salt, silver, and the stone industry.

TEHAMA COUNTY—Table of Mineral Production.

Year	Gold, value	Chrome		Brick		Mineral water		Salt, value	Stone, value	Other min- erals, value
		Tons	Value	M	Value	Gallons	Value			
1880-1884	\$22,000									
1894		1,680	\$12,680							
1895		950	9,025	500	\$2,500					
1896		56	475							
1897						10,000	\$2,400			
1898				200	1,400	54,000	8,000			
1899				300	1,800	10,000	18,000			
1900				325	2,200					
1901				300	2,000	20,000	4,000			
1902				500	3,500					
1903				600	4,500	5,000	2,500			
1904				500	3,500					
1905				650	5,000	8,000	4,000			
1906				700	5,600	8,000	4,000			
1907				400	3,200	550,000	55,000			
1908				400	3,000	20,000	2,000	300		
1909						5,000	500	300		
1910				600	3,600	5,000	500	300		
1911						5,000	500			
1912				225	1,800					
1913				300	1,800	75	42		\$600	
1914						100	100	200		
1915		*	*	400	2,700	1,000	500	*	750	\$752
Totals.	\$22,000		\$22,180		\$47,600		\$102,042	\$1,100	\$1,350	\$752

*Included under "Other Minerals."

Total mineral production, 1880-1915 (incl.).

Gold	\$22,000
Chrome	22,180
Brick	47,600
Mineral water	102,042
Salt	1,100
Stone industry	1,350
Other minerals	752
Total	\$197,024

CHROMITE.

A belt of serpentine having a general north and south trend runs through the southwestern part of the county. This belt is on the lower eastern slope of the Coast Range Mountains. In this serpentine float of chromite is found in a great number of places. Most of the mining operations on these deposits have been conducted in the neighborhood of the north fork of Elder Creek.

Basler Mining and Development Company's chrome deposits are situated in Secs. 4 and 8, T. 25 N., R. 7 W., about 28 miles southwest of Red Bluff.

The chromite occurs in lenses in the serpentine. This company controls 11 claims along a belt of serpentine striking north and south. Owing to their remoteness from railway transportation, only a small amount of development has been done on these claims.

M. J. Cheatham of Red Bluff, owns deposits of chromite in Sec. 16, T. 24 N., R. 7 W. They were formerly worked by the Tehama Consolidated Chrome Company of Red Bluff. (See Reports, X, p. 692; XII, p. 38; XIII, p. 50; also Bulletin No. 38, p. 272, of the California State Mining Bureau.) These deposits have been mined in 3 places and ore was shipped from the property in 1898. The ore was hauled a distance of 30 miles to Red Bluff, which was the nearest shipping point.

Noble Electric Steel Company's chrome mine. See our Reports, X, p. 692; XII, p. 38; XIII, p. 50. This property is situated on the north fork of Elder Creek, in Sec. 16, T. 25 N., R. 7 W., about 28 miles west of Red Bluff at an elevation of 2000 feet. The ground has been taken up as a surface claim covering 640 acres. The deposits consist of a series of separate lenses inclosed in the serpentine, and 10 to 12 of such lenses have been developed. The largest of these lenses is about 60' in length by 60' in width, located in a gulch which runs into Elder Creek. They have been worked in the past by a system of open cuts. The serpentine belt in which these deposits occur is about 3 miles in width, and can be traced through the county. It has a general north and south trend. To the east of this belt the country rock is slate, while on the west the formation is a syenite. Chrome iron has been proved to occur for at least 10 miles along this belt. In all the gulches running into Elder Creek are also noticed quantities of magnesite.

On the opposite side of the creek from where the chrome ore was mined there is a vein of pectolite about 20' wide, which courses north and south and dips west in the serpentine. In this vicinity along the banks of Elder Creek are several saline springs.

Fifteen men were employed building a wagon road up Elder Creek to these deposits, with the plan of mining and shipping the ore to the Noble Electric Steel Company's electric smelter at Heroult, Shasta County.

CLAYS.

There are undoubtedly several clay deposits in the Sacramento River bottom lands of Tehama County, but very few have been used for the manufacture of brick.

O'Conner Brothers of Red Bluff, own a clay deposit on the Reed Tract, in Sec. 29, T. 27 N., R. 3 W. The deposit covers an area of

over 19 acres, about 5 of which have been worked by pits, showing a good quality of brick clay for a depth of from 8' to 11', underlaid by gravel. The bricks are made in a soft-mud machine worked by horse power. They are sun dried and burned in open kilns. The full capacity of brick yard, when running, is about 16,000 bricks per day. The bricks are used locally.

COPPER.

California and Massachusetts Copper Mines. These properties are situated on the north slope of Tom Head Mountain, about 40 miles west of Red Bluff. The holdings consist of 3 claims, namely: Sulphide, Uncle Sam, and Spring. The deposit occurs in the form of a vein striking N. 75° W. and dipping 65° N. in diabase. This vein is capped on the surface by iron gossan. The ore is chalcopyrite, associated with pyrite. Developments consist of two tunnels, at an elevation of 4150'; a crosscut tunnel has been driven south into the mountain 420', cutting the vein at a distance of 150' from the portal, then drifts run east and west for a distance of 200'.

The width of ore developed on this level was about 5'. Several winzes have been sunk from this level on the vein to depths of 30'. About 150' above this tunnel there is another tunnel 366' long, which intersected the vein at 66' south of portal, with drifts east 150 feet and west 100' on the vein. The ore developed on this level varies in width from 4' to 20'. The ore so far developed has a very low copper content. The equipment on the property consists of an 80 h.p. boiler, 12" x 14" x 14" Sullivan air compressor, cars and track, with tool and blacksmith shops. Idle. California and Massachusetts Copper Mines Co., owner, William Wrigley, Jr., president; J. C. Cox, secretary. Kestner Bldg., Chicago, Ill.

GOLD.

In former days some placer mining was carried on in the upper reaches of the Sacramento River, but this has entirely ceased.

Gold bearing quartz veins have been discovered on Tom Head Mountain, in the Coast Range Mountains, and also in the neighborhood of Paskenta. Due to their remoteness from railroad transportation, only a small amount of prospecting has been done on the veins in these districts.

Bowers Creek Mine is a prospect 10 miles west of Paskenta, situated on the east slope of Beauty View Butte. The vein strikes N. 50° W. and dips 60° in the diabase. A tunnel has been driven 30' on the vein, which averages 18" in width. Idle. D. H. Thurston, E. P. Logan et al., of Paskenta, owners.

MANGANESE.

Some very promising deposits of manganese ore have been found on Beauty View Butte, about 10 miles west of Paskenta. Only superficial work has been done on these deposits, on account of their distance from railway transportation. The nearest shipping point is the town of Corning, on the Southern Pacific Railroad—a distance of 30 miles. These deposits are located in a belt of serpentine which strikes north and south. The manganese occurs in a lenticular bed interstratified with red and gray jasper. The ore, when fresh, is a hard, black, massive variety, steel blue in color, with a well developed conchoidal fracture. On an exposed surface it becomes soft and breaks up into fine black powder. The ore contains a large amount of silica in the form of quartz veins and unaltered chert. The deposits are made up of a series of irregular lenticular bodies, more or less isolated and separated by many feet of barren rock. The general strike of these deposits is N. 20° W. Five to six outcrops of manganese ore were noticed, varying in width from 10' to 30'.

Elva Manganese Mine is a prospect 10 miles west of Paskenta, situated on south slope of Beauty View Butte. It lies in Sec. 20, T. 23 N., R. 7 W. C. S. Benner of Paskenta, owner.

Manganese Peak Mine. This prospect is situated on Beauty View Butte, north of Bowers Creek. Two claims have been taken up, called Manganese Peak and Success. The deposits of manganese ore on these claims from the outcrops, appear to be quite extensive, and in places show a width of 10' to 30'. The only work on these outcrops are a few shallow open cuts. Idle. Alonzo Luce, Virgil Apperson et al., of Willows, Cal., owners.

Rosy and Sophie Manganese Mines. Situated in Sec. 14, T. 24 N., R. 7 W., M. D. M., on ridge south of Elder Creek. C. S. Benner and D. H. Thurston, of Paskenta, Cal., owners.

MINERAL SPRINGS.

(See Water Supply Paper No. 338 on Springs of California, by G. A. Waring, of United States Geological Survey.)

Colyear Springs. These springs are situated high on the mountain side north of the North Fork of Elder Creek, 35 miles west of Red Bluff. Six springs here rise in a cemented place 5 yards in diameter, among the pine trees, on a moderate slope. One of the largest yields cold sulphur water, while the others are only slightly sulphuretted. On the slope about 8 yards above these springs, there is a clear water spring that yields 4 to 5 gallons a minute. Dr. J. A. Owen of Red Bluff, owner.

Morgan Springs. They are situated on the Morgan Ranch, about 50 miles northeast of Red Bluff. There are a group of 25 springs and pools scattered for a distance of $\frac{1}{4}$ mile in a meadow along Mill Creek; this meadow is termed Big Hot Spring Valley. Most of them are quiet pools of small flow, as a rule less than 5 feet in diameter and relatively shallow. A number of them contain thick algous growths, and several deposit native sulphur. A number of springs steam and sputter from vents in a hard conglomerate along the banks of the creek. One of the northernmost of these springs seems to have a true geyser action, for it issues from a shallow basin 3 feet in diameter, in which the water comes to a state of vigorous ebullition and



View of Big Hot Springs Valley. Morgan Springs.

then subsides. The place is used as a summer resort, there being a number of houses and tents which are rented by the owner during the summer months. Along the creek are a number of bathhouses and a swimming pool. There are also several vapor bathhouses built over vents at the creek edge. W. E. Hamlin of Mineral, Cal., owner.

Tuscan Springs. These springs are situated 10 miles northeast of Red Bluff, near the head of the cañon of Salt Creek. Tuscan Springs were discovered in 1856 by Dr. John A. Veatch, who, in a chemical examination of the waters, discovered crystals of borax, said to be the first borax found in the state. The springs are situated at an elevation of 1000 feet above sea level. The cañon of Salt Creek widens at its head to a small valley surrounded by rugged cliffs, and the springs issue along the main creek and its branches in this open area.

The springs rise in a dark shale and sandstone, the latter material being veined in places by calcite. The structure shows that the beds have been folded into a small arch or anticline. Dips of 50° on the western side of the fold are observed.

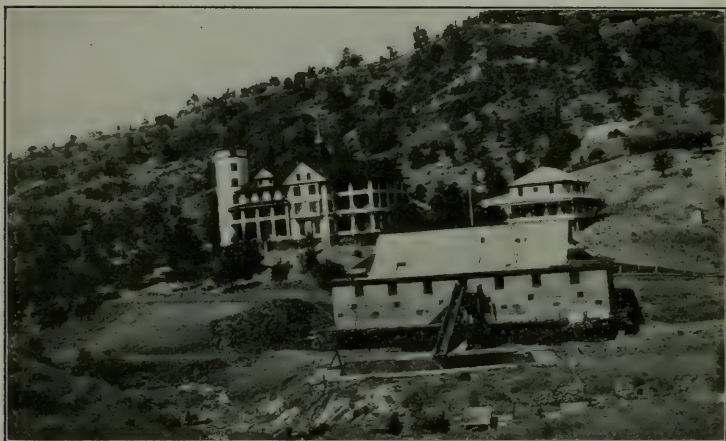
The occurrence of usable quantities of illuminating gas is worthy of mention in connection with this anticlinal structure. The sediments are overlain by volcanic tuff, which forms the cliffs of the cañon walls. As many as 50 springs are claimed for the locality. Spring houses protect some of those that are most used for drinking purposes. Water from another spring supplies evaporating trays, in which occasional amounts of medicinal salts are prepared for sale. Two other springs rise in cemented reservoirs about 15' and 20' in diameter. Gas from one of these, which is called the Natural Gas Spring, is piped to a tank higher on the hillside for use in lighting purposes in hotel and cottages; and water from the other spring, which is called the Fountain Spring, supplies the baths and swimming pool. Most of the springs rise in brick and cemented basins. All springs are within 250 yards southeast of the hotel, which is on higher ground overlooking them. Most of the springs have a small flow, but all are strongly mineralized. Some are strongly sulphuretted as well as saline. The following analyses indicate that they are primary saline waters, remarkably uniform in composition for springs of such high mineral content, the chief difference being in the high sulphate content of Spring No. 1. There is a remarkably high potassium content in all but the Natural Gas Spring.

Analyses of Water From Five of the Tuscan Springs.*
Constituents are in parts per million.

Constituents	No. 1		No. 2		No. 3		No. 4		No. 5	
	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values
Sodium (Na) -----	8,096	352	8,349	383	8,241	358.3	7,944	345.4	8,386	364.6
Potassium (K) -----	29	.75	2,448	82.6	3,353	85.8	2,705	69.2	2,851	72.9
Lithium (Li) -----	.3	.05	1.7	.24	2.0	.29	1.9	.27	1.9	.2
Barium (Ba) -----	3.7	.05								
Calcium (Ca) -----	144	7.20	67	3.34	66	3.28	68	3.37	68	3.41
Magnesium (Mg) -----	92	7.59	23	1.86	28	2.37	27	2.21	21	1.71
Iron (Fe) -----	13	.47	.9	.03	Trace	Trace	Trace	Trace	0	0
Sulphate (SO ₄) -----	351	7.30	2,108	43.9	420	8.76	448	9.33	680	14.15
Chloride (Cl) -----	12,460	851.40	13,540	381.9	15,440	435.6	14,380	405.6	15,020	423.6
Carbonate (CO ₃) -----	281	9.38	156	5.20	166	5.55	167	5.58	154	5.12
Silica (SiO ₂) -----	35	1.17	13	.48	13	.43	5.6	.19	5	.02
Totals -----	21,505		26,706.6		27,729		25,746.5		27,182.4	
Hydrogen sulphide -----	383	22.54	320	18.77	122	7.16	84	4.94	294	17.23

*U. S. G. S., Water Supply Paper No. 338, p. 290.

Tuscan Springs are open all the year round. The waters are reported to be especially beneficial for blood and skin diseases, also for malaria, kidney, liver and rheumatism. E. B. Walbridge Estate, Red Bluff, owner. Mrs. E. B. Walbridge, manager.



View of hotel and bath houses, Tuscan Springs, Tehama County.

White Sulphur Spring. There is a small, cool sulphur spring about $1\frac{1}{2}$ miles northeast of Mineral post office, which is near the southern base of Lassen Peak. It issues in a ravine 15 yards from the eastern bank of Summit Creek, and about 150 yards east of the stage road. The spring issues from basaltic lava, at the rate of 8 gallons per minute, of cold, noticeably sulphuretted water, which deposits small amounts of sulphur. It is the only cold spring seen in the Lassen Peak region, the other sulphur springs being of a notably thermal character. A. L. Conrad of Red Bluff, owner.

SALT.

See Tuscan Springs, under Mineral Water.

PART III

The Counties of

El Dorado, Placer,
Sacramento, Yuba

By W. BURLING TUCKER and CLARENCE A. WARING,
Field Assistants.

PREFACE.

The group of counties here presented lies west of Lake Tahoe and includes the northern end of the Mother Lode of California. It includes a strip across the Sierra Nevada Mountains east of Sacramento as well as a strip along the foothills of the same range and a portion of the Sacramento Valley.

Generally speaking, the group is fairly well provided with transportation facilities and electric power, especially in the western portion. These factors should lend encouragement to a greater development of the region, for the cost of extensions to the outlying districts is not prohibitive.

The group presents a diversity of mining interests which made the work of especial interest. An endeavor has been made to make this report a directory of all mines in these counties as well as describing those being operated.

Acknowledgment is made of the courtesies extended by the mine owners and operators throughout the region, whose assistance made this report possible.

EL DORADO COUNTY.

By W. BURLING TUCKER, Field Assistant.

Field Work in December, 1914.

INTRODUCTION.

The following report represents only a little over a month's field work in the county, as owing to the season of the year, the north and eastern sections of the county were covered with snow. Hence, it was impossible to investigate the more remote mining districts; but, by combining the writer's personal observations on the principal properties with other data from reliable sources, all deposits of any importance have received attention, and are accurately recorded.

DESCRIPTION.

El Dorado County has the distinction of being the scene of Marshall's discovery of gold at Coloma, and the earliest beginning of the modern era of gold mining.

El Dorado County is bounded on the north by Placer, on the south by Amador, on the east by Alpine County, and the state of Nevada, and on the west by Sacramento and Placer counties. The Middle Fork of the American River separates this county from Placer, while the Cosumnes separates it from Amador County. These rivers, with their numerous branches, constitute the principal streams found in El Dorado County. In the eastern part of the county, at an altitude of about six thousand feet, a number of lakes occur; Lake Tahoe, the most important body of fresh water in California, being partly in this county, and is one of the scenic wonders of California.

Three-fourths of this county, including the more mountainous parts, are heavily wooded, the timber consisting of stately forests of pine, spruce and cedar. The balance is covered with a more scattered growth of oak and inferior pine, there being very little timber of any kind in the extreme western portion of the county.

POWER.

Electric power is furnished to the mines by the Western States Power Company, and water by the San Francisco-Oakland Terminal Power Company.

TRANSPORTATION FACILITIES.

From San Francisco and other important trade centers, this county has the benefit of good railroad communication by means of the Southern Pacific Railroad to Sacramento, from which point a branch

line of the same system over the Sacramento and Placerville Railroad to Placerville passes through Shingle Springs, El Dorado and Diamond Springs, with terminus at Placerville.

ROADS.

The main state highway, which is at present under construction, runs from Sacramento via Folsom and Placerville to Lake Tahoe and Carson City, Nevada, the proposed route running directly east through the center of the county. The principal mining districts are in easy communication by means of good wagon roads with different railway points.

GENERAL GEOLOGY.

The western margin of the county is followed by a belt of the Calaveras formation, greatly broken by later intrusions and in part accompanied by greenstone tufts of the Carboniferous age. The late Jurassic, Mariposa formation, accompanied by large masses of greenstones and greenstone tufts, traverses the western area in a narrow band from north to south. East of these rocks the Calaveras formation, having a prevailing northerly trend, occupies the greater eastern part of the county. A large area of gabbro-diorite lies near the western margin; numerous serpentine areas of elongated form are found in the same vicinity.

Gabbro, gabbro-diorite and serpentine belts traverse the county along a line from about one mile east of Placerville to a mile east of Georgetown.

The main granitic area of the high Sierra makes up the eastern part of the county. Tertiary auriferous gravels are exposed near Placerville. Rhyolitic tufts lie in the old stream beds on the Long Cañon divide and especially underneath the Placerville and Newtown divides. Andesitic tuff-breccias cap many of the ridges from the Cosumnes to Long Cañon, but the largest masses are found on the Placerville and Newtown divides.

MINERAL PRODUCTION.

The principal mineral resources of El Dorado County, many of them undeveloped, are: Asbestos, Barytes, Chromite, Clay, Copper, Gems, Gold, Iron, Molybdenum, Limestone, Quartz Crystals, Quick-silver, Glass-sand, Slate, Soapstone, Silver and Miscellaneous Stone.

EL DORADO COUNTY—Table of Mineral Production.

Year	Gold. value	Silver. value	Copper		Lime		Limestone		Slate		Stone industry, value	Miscellaneous and unapportioned	
			Pounds	Value	Barrels	Value	Tons	Value	Squares	Value		Kind	Amount
1880	\$880,383	\$208	---	---	---	---	---	---	---	---	---	Unapportioned, 1900-1909	\$251,820
1881	550,000	900	---	---	---	---	---	---	---	---	---	---	---
1882	600,000	---	---	---	---	---	---	---	---	---	---	---	---
1883	530,000	---	---	---	---	---	---	---	---	---	---	---	---
1884	575,000	16,000	---	---	---	---	---	---	---	---	---	---	---
1885	35,000	---	---	---	---	---	---	---	---	---	---	---	---
1886	619,992	1,822	---	---	---	---	---	---	---	---	---	---	---
1887	706,871	365	---	---	---	---	---	---	---	---	---	---	---
1888	650,000	500	---	---	---	---	---	---	---	---	---	---	---
1889	427,638	408	---	---	---	---	---	---	---	---	---	---	---
1890	204,583	275	---	---	---	---	---	---	---	---	---	---	---
1891	173,279	359	---	---	---	---	---	---	---	---	---	---	---
1892	168,321	---	---	---	---	---	---	---	---	---	---	---	---
1893	204,610	1,220	---	---	---	---	---	---	---	---	---	---	---
1894	366,707	356	---	---	10,000	\$8,000	---	---	1,800	\$11,700	---	---	---
1895	700,101	448	---	---	23,500	28,500	---	---	1,350	9,450	---	---	---
1896	812,289	534	---	---	4,413	4,158	---	---	500	2,500	---	---	---
1897	674,626	886	---	---	13,500	6,750	500	\$250	400	2,800	---	---	---
1898	501,966	4,174	---	---	3,360	3,360	---	---	400	2,800	---	---	---
1899	404,497	8,414	---	---	7,935	7,935	---	---	600	4,500	---	---	---
1900	368,541	25,129	3,125	\$500	7,500	6,000	---	---	3,500	26,250	---	---	---
1901	292,086	5,977	---	---	11,000	11,000	---	---	5,100	38,250	---	---	---
1902	335,031	52	2,128	319	24,599	16,176	---	---	4,000	30,000	---	---	---
1903	277,304	---	---	---	5,690	7,000	---	---	---	---	---	10 tons of asbestos	162
1904	474,994	---	---	---	12,864	7,075	---	---	6,000	50,000	---	112 tons of asbestos	2,625
1905	384,735	2,525	160,000	24,960	9,260	6,946	1,050	5,775	4,000	40,000	---	20 tons of asbestos	1,000
1906	431,746	2,690	---	---	10,217	21,138	---	---	10,000	100,000	---	---	---
1907	319,177	2,301	---	122	16,198	16,198	---	15,318	7,000	60,000	---	---	---
1908	342,033	5,504	603	83	15,921	20,192	---	---	6,000	50,000	\$1,600	200 M. paving blocks	8,000
1909	298,284	1,299	---	---	13,828	14,591	---	---	6,961	45,660	530	3,763 tons of sand (glass)	5,645
1910	171,304	907	---	---	11,300	9,944	---	---	1,000	8,000	2,616	1,200 tons of sand (glass)	1,800
1911	135,967	1,010	---	---	15,068	12,309	1,000	1,000	---	---	4,375	3,701 pounds of lead	167
1912	106,566	843	---	---	14,023	11,218	---	---	---	---	4,678	---	---
1913	62,688	250	683	107	---	---	---	---	---	---	2,600	90 pounds of lead	4
1914	135,000	400	---	---	14,000	12,062	---	---	---	---	7,500	Other minerals*	5,250
1915	401,288	1,353	417	73	15,911	12,872	---	---	---	---	---	---	---
Totals	\$13,885,506	\$87,377	166,963	\$26,164	257,817	\$243,444	---	\$22,343	58,611	\$481,910	\$29,364	---	\$276,473

*Includes slate and soapstone.

Total mineral production of El Dorado County from 1880 to 1915 inclusive:

Copper -----	\$26,164
Gold -----	13,888,556
Lime -----	243,444
Limestone -----	22,343
Stone industry -----	29,364
Silver -----	87,377
Slate -----	481,910
Miscellaneous and unapportioned -----	276,473
	<hr/> \$15,055,631

CHROME.

Pilliken Chrome Mine. Located 10 miles northeast of Folsom, Sacramento County, and one mile northwest of Flagstaff Hill, in Sec. 28, T. 11 N., R. 8 E., M.D.M. Elevation 1100'-1240'.

The chrome occurs as lenses in serpentine and is in places associated with a fine-grained reddish quartzite carrying small inclusions of chromite.

The lower workings, at an elevation of 1100', consist of a 100' tunnel crosscutting the ore body which strikes E.-W. and dips 15° N. The ore has been stoped to the surface and 800 tons are said to have been taken out.

The old upper workings, at an elevation of 1240', consist of a 60-foot tunnel at the end of which the ore has been glory-holed to the surface. The ore body has a strike N.-S. and dips 35° W.

New works to the south of the old upper workings, at an elevation of 1100', have followed an ore body striking N.-S. and dipping 23° E. A 30-foot open cut and 40' incline stope show a 12' face of solid chrome ore. Another lens of ore has been opened up, at an elevation of 1140', just west of the last described workings. The ore body here strikes N.-S. and dips 35° E. A stope 50' long and 40' deep, with a horse of serpentine in the center, shows a 4' chimney of ore.

Twenty-five men, including nineteen miners, were employed when the deposit was visited in September, 1916. Leased to the Noble Electric Steel Corporation, Heroult, Shasta County, by George Pilliken of Folsom, owner.

COPPER.

General Geology of the Copper Belt.

The copper belt of El Dorado County passes through the lower western portion, along the edge of the Sacramento Valley, including about 25 miles of the "foothill copper belt." Along this line the belt mentioned displays many copper deposits that have been prospected in a superficial way. They are but a little north of the section of the belt through Amador and Calaveras counties, in which the chief



Chrome mining at the Pilliken property, El Dorado County; 10 miles northeast of Folsom, Sacramento County. Photo by C. A. Waring.



Loading chrome ore, from the Pilliken property, at Folsom. Photo by C. A. Waring.

development and production of this copper belt have occurred. While a number of the best developed copper properties display very wide veins carrying ores that often assay well, and continuous gossan cappings of copper-bearing lodes which can be traced for miles, no producing mines of importance have been developed in El Dorado County. Some of the ore bodies carry good values in gold and silver along with good percentages of copper sulphides.

The copper ores occur as vein deposits along the granodiorite in the zone of contact metamorphics, and one prospect lies south of Deer Creek in the amphibolite schist. Also small masses of copper pyrites occur in the serpentine and amphibolite about two miles west of Greenwood. There is every indication of an east and west belt in the foothill section. The Lilyama and Pioneer mines are on the east belt, while the Alabaster Cave Mine is on the west belt. Another belt might include the Noonday and E. E. mines, east of El Dorado. These two are just at the east line of the Mariposa slates. About three miles north is the Larkin copper mine, on the same belt, as it is along the east edge of the Mother Lode formation. About twelve miles north are the El Dorado copper mine and other properties, that occur just east of the Mother Lode formation.

MINES.

Alabaster Cave Mine. Bull. 50, pp. 211-212. The property is located on 180 acres of patented land in Secs. 10 and 15, T. 11 N., R. 8 E.; elevation 800'; 5 miles from Newcastle station, on Southern Pacific Railroad. Owner, W. Russell, Santa Cruz, California. Developments consist of three shafts, two of 50' and one of 300', and two tunnels, one of 100' and one of 30'. The vein matter consists partly of mineralized diabase, and 8' to 10' of ore, composed of oxides, malachite, azurite, and some unaltered sulphides near the surface, and of sulphides, chalcopyrite, bornite, etc., in depth. Reported to average 3% to 4% copper with some values in gold and silver. Idle.

Bob or Iron Crown Mine. Sec. 13, T. 12 N., R. 10 E. Vein 40' \pm wide between serpentine and slate. Values reported as \$7.00 in gold, silver 1.58 oz. and some copper. Developed by shaft in east wall and by shallow cuts. Gossan cap. Owned by S. B. Selkirk and Geo. W. Dent.

Bibl.: Bull. 50, pp. 219-220, 1908.

Cambrian Mine. Sec. 23, T. 11 N., R. 9 E. Ten miles from Placerville. Three veins of talcose schist and limestone between granodiorite and serpentine. Veins from 50' to 70' apart and average 6 to 8' in width. Dip east. Ore consisted of chalcopyrite, malachite, cuprite

and native copper carrying some gold. Reported to average 10% copper. Developed by tunnels. Owned by the Cambrian Mining and Milling Co.

Bibl.: Bull. 50, pp. 213-214, 1908.

Contraband Copper Mine. See our Bull. 50, pp. 214, 216, "The Copper Resources of California." It is situated 2 miles southeast of Georgetown and 20 miles east of Auburn on the Southern Pacific Railroad. Elevation 3550'. Vein about 12' wide, between hanging wall of micaceous schist and diabase footwall. Strike N. 80° E., dip 45° N. Ore: oxides, native copper and sulphides reported to contain as high as 18% copper, with gold and silver values. There is also an asbestos deposit on the property. Development consists of several tunnels and shallow shafts. Idle. Woodside-Eureka Mining Co., 204 Bacon Bldg., Oakland, Cal., owner.

Cosumnes Copper Mine. See our Bull. 50, p. 214. It is situated 2½ miles northeast of Fairplay. The vein strikes NE.-SW., and is a mineralized limestone and amphibolite schist. The limestone belt is 500' wide, showing sulphides in limestone near the surface. The ore is sulphide, malachite, azurite and oxide, with reported values of over 4% copper, also some gold and silver. The property has been developed by three tunnels. Idle. Rio Vista Gold & Copper Co., owner.

E. E. Copper Mine. See our Bull. 50, pp. 218-219. It is located 4 miles east of El Dorado in Sec. 18, T. 9 N., R. 11 E. The ore occurs in lenses in a meta-diabase. The strike of vein is N. 4° E., dip 85° E. The ore is copper sulphide associated with pyrite, carrying gold and silver values. Developments: a vertical shaft 85' deep with 300' of drifts; two tunnels, one 300' long, the other 100'. Property worked off and on by the owner. Joseph Schuppi of El Dorado, owner.

Larkin Copper Mine. See our Bull. 50, p. 217. This property is situated 4 miles south of Placerville, and 1½ mile west of Diamond Springs, on the Southern Pacific Railroad. The vein is 3' wide with schist walls, and strikes N. 20° E., dip 80° E. Ore: chalcopyrite, malachite, pyrite, iron oxide, with gold and silver values. Developments: 160' vertical shaft, with crosscut 45' east on 150' level, which cut a vein 15' east of shaft; drift north 100' on the vein. Idle. Warren Larkin of Placerville, owner.

Lilyama Mine. See our Bull. 50, p. 212. It is located 11 miles southeast of Auburn on the Southern Pacific Railroad in Sec. 3, T. 11 N., R. 9 E. A belt of limestone between granodiorite and quartz-porphry walls carries ore in the form of lenses. The croppings are gossan and nearly pure black iron oxide (magnetite). The ore consists of sulphides of copper associated with pyrite. The ore is reported

to run as high as 10% copper with gold and silver values. Developments: Tunnel 350' long and shaft 25' deep. Idle. Robert Crocker & Co. of Placerville, owner.

Noonday Copper Mine. See our Bull. 50, p. 220. It is situated $4\frac{1}{2}$ miles east of El Dorado, in Sec. 18, T. 9 N., R. 11 E. The ore occurs as lenses in a meta-diorite. The vein is 7' wide; strike N. 4° E., dip 85° E. The ore consisting of bornite and chalcopyrite associated with pyrite, is reported to have-yielded 5% to 9% copper, with about \$3.00 in gold per ton, and a little silver. Developments consist of a vertical shaft 200' deep with 280' of drifts on the vein. There is a 60 h.p. boiler and single drum hoist on the property. Idle. Peyton Chemical Co. of San Francisco, owner.

Oest Mine. Sec. 4, T. 13 N., R. 8 E. Vein between diorite and schist carries chalcopyrite, pyrite, native copper and malachite. Developed by shaft. Idle. Owned by H. Oest of Auburn.

Bibl.: Bull. 50, p. 217, 1908.

Pioneer Copper Mine. See our Bull 50, p. 213. Situated $2\frac{1}{2}$ miles east of Pilot Hill, and about 11 miles southeast of Auburn, Placer County. The deposit is in the form of a mineralized limestone 50' to 60' wide, with a granodiorite footwall and quartz-porphyry hanging-wall. The mineralized zone strikes north and south, with a dip towards the west. The ore occurs in lenses in the limestone. The developments consist of a tunnel 900' long, and two shafts, 90' and 100' in depth. Idle. William Haker of New York City, owner.

Robert Mine. Sec. 13, T. 9 N., R. 11 E. Three and one-half foot quartz vein between schist and slate. Developed by shaft and tunnel. Owned by W. L. and L. Robert.

Bibl.: Bull. 50, p. 216, 1908.

GOLD.

General Geology of "Mother Lode" and Gold Bearing Belts of El Dorado County.

The most important mines of El Dorado County are located on the Mother Lode in an area of Mariposa slates, traversing the county from north to south. The Mother Lode, which must not be considered a continuous vein, but rather as a belt of parallel, though sometimes interrupted, quartz-filled fissures, can be traced continuously as far north as the St. Lawrence mine on the Georgetown divide. Along it are found many celebrated mines, such as the Nashville, Montezuma, Church Union, Pacific, Poverty Point and Gopher-Boulder. The veins run parallel to the strike of the slates, or cut them at a very acute angle. The dip is nearly always to the east, and usually at a somewhat less steep angle than that of the surrounding slates. Along the veins of

the Mother Lode frequently run narrow streaks of amphibolite-schist and serpentine. The eastward bend in the strata caused by the intrusive granodiorite in the vicinity of Placerville is closely followed by the veins. North of the St. Lawrence mine the Mother Lode is not well defined. The quartz veins are more frequently interrupted and are replaced by a peculiar kind of deposit, the "seam diggings." In these, a certain belt of slate is impregnated with minute irregular quartz veins, frequently very rich in gold. Such seam diggings occur at Georgia Slide, Spanish Dry Diggings, Greenwood and other places. From the St. Lawrence one branch of auriferous quartz deposits runs up towards Georgetown and Georgia Slide. Another belt begins by the Esperanza mine, north of the St. Lawrence, and continues with frequent interruptions to the Sliger vein and Oregon bar, both on the middle fork of the American River. On both sides of the great serpentine belt, running from Volcanoville to the Cosumnes granodiorite area, near the contact are numerous small quartz veins, very rich in scattered bunches and pockets of gold. Few permanent mines are found, however, along these contacts. The only important mining district in the eastern part of the county is that of Grizzly Flat. A long stretch on the contact of slates and granodiorite, from the middle fork of the Cosumnes to the "Buttes," is mineralized and accompanied by a great many auriferous quartz veins, the most prominent of which is that at the Mount Pleasant mine.

This county, which in past years has produced a very large amount of gold, is at present passing through a temporary period of inactivity, due partly to scarcity of water. The county offers abundant legitimate and promising opportunities to those with both capital and experience to handle large low grade mines.

GOLD MINES—QUARTZ.

Adams Gulch Mine. See our Report XII, p. 101. It is 2 miles north of Nashville, at 1200' elevation, and comprises the following claims: Adams Gulch, White Oak, Sullivan and Stony Point, including a total of 320 acres. The vein strikes N. 10° W., dip 60° E. Width of vein is 4' in Mariposa slates. Developments consist of two tunnels; upper tunnel is 180' long, lower crosscut tunnel has a length of 220'. Two men are employed cleaning out and driving lower tunnel. J. C. Heald of Nashville, owner.

Adjuster and Hustler Mines. They are situated 2 miles south of Diamond Springs, on Mathenas Creek. Vein strikes N. 20° E., dip 70° E., in Mariposa slates. Two tunnels on property, one 123', the other 100' long. Two men employed. R. B. Seward, of Diamond Springs, owner.

Adjuster Mine. A prospect 3 miles east of El Dorado. Vein strikes north and south in slate. Average width of vein is 5'. Development: crosscut tunnel 250' to vein, with a drift 50' north and 75' south on vein. Idle. O. A. Ingram, of El Dorado, owner.

Alpine (Union Consolidated) Mine. See our Report VIII, pp. 167, 168. Situated $2\frac{1}{2}$ miles southwest of Georgetown, at an elevation of 2550'. Comprises the following claims: Leap Year, Manhattan Placer mine, Alpine, Alpine Jr., with a total area of 180 acres. The formation is amphibolite schist. The strike of the vein is N. 25° W., dip 60° E., with average width of 12'. Shaft sunk on the vein to 100' level from which point to 400' level the shaft is in the footwall of vein. The vein has been developed on the 100', 200', 300', 400' levels. On the 100' level, drifts N. 150', S. 400'; on the 200' level, drifts N. 75', and S. 400'; on 300' level, drifts 100' N. and 450' S.; on the 400' level drifts 50' N. and 450' S. The ore is free milling with $1\frac{1}{2}\%$ to 2% pyrite. Idle. Lucero Gold Mining Co., Inc., 530 Wilcox Bldg., Los Angeles, owner.

Argonaut Mine. See our Report X, p. 176. It is one mile east of Greenwood. The vein has an average width of 15'; strikes NW. and SE., dip 60° E. Tunnel 500' on vein. Idle. Ford & Co., of Auburn, Placer County, owner.

Baldwin (National) Mine. See our Report XII, p. 102. It is two miles east of Nashville. Consists of one claim 3000' in length by 300' wide. The vein has an average width of 15', strikes N. 10° E., dips 60° E. in Mariposa slates. There is a shaft 200' deep sunk on a 70° incline. The vein has been developed on the 100' and 170' levels. On the 100' level there is a drift 50' N., and 50' S.; on the 170' level, drift 60' N. and 150' S. The vein has been stoped from 100' level to surface. The present workings are confined to a quartz stringer lead in footwall of main vein. The equipment consists of 80 h.p. boiler, single drum hoist, and 6-foot Huntington mill. The property is under lease to O. N. Hirst, of Nashville. Three men are employed. E. J. Baldwin Est., of San Francisco, owner.

Baltic Mine. See our Report XIII, p. 133. Situated 8 miles northwest of Grizzly Flat, at 4250' elevation, and comprises four claims. A 12" vein strikes NE. and SW. and dips 50° E. between slate walls. Developments consist of tunnel 500' long and an incline shaft 130' deep. Idle. Reeg & Sciarossi, of Placerville, owners.

Balmaceda Mine. It is $1\frac{1}{2}$ miles northeast of Nashville, on ridge east of north fork of Cosumnes River. There are two parallel veins in Mariposa slates, which strike N. 20° E., dip 65° E. The veins have an average width of 4'. A tunnel 500' long has been driven on west vein. The ore has been stoped out above tunnel level to surface on

ore shoots, which have a length of 40' to 100'. Two men are employed. J. C. Heald, of Nashville, owner.

Barnes-Eureka (Greenstone) Mine. See our Report XII, pp. 102 and 112. Situated 3 miles northeast of Shingle Springs, on ridge east of Slate Creek. There are two claims: Barnes and Eureka. The vein occurs on contact between serpentine and diabase. The vein has an average width of 2', and strikes N. and S., with a dip 45° E. It carries free gold with arsenical pyrites and tellurides of gold. Two incline shafts on the property, having depths of 250' and 350'. Idle. R. K. Berry, J. J. Blair, of Placerville, owners.

Beattie and Parsons Consolidated Mine. (Seam Diggings.). See our Reports XI, p. 203; XII, p. 102; XIII, p. 133. It is 1½ miles north of Georgetown, on the porphyry seam belt. The formation is traversed by slates and schists, and intercepted by numerous gold bearing quartz seams. Idle. Ida Barklage Brown et al., of Georgetown, owners.

Bidstrup Mine. It is 2 miles south of El Dorado. Vein 12" wide in granodiorite. Strike north and south. Developments: shaft 35' deep, tunnel 185' long. Idle. W. I. Bidstrup, of El Dorado, owner.

Big Chunk Mine. It is ½ mile east of Kelsey. Developments: incline shaft 100' deep, tunnel 150' in length. Idle. Mrs. Margaret Smith, of Kelsey, owner.

Big Four Mine. It is a prospect one mile south of Garden Valley. Worked as a pocket mine. Idle. Mrs. M. E. Rhodes and John Hurley, of Garden Valley, owners.

Big Sandy Mine. See our Report X, p. 173. It is ¼ mile south from Kelsey, at elevation of 1900' and comprises the following claims: Grey Eagle, Big Sandy, and Marshall mill site. On Mother Lode belt in Mariposa slates. The vein has an average width of 500' with a strike of N. 12° W., dips 70° E. Developments consist of a vertical shaft 334' deep, with levels at 74', 124', 227', and 323', with crosscuts west to vein from shaft, and drifts north and south on vein. Old 10-stamp mill on property. Idle. Big Sandy Mining Co., care Chas. Breyman, Nasby Bldg., Toledo, O., owner.

Black Hawk Mine. It is a prospect, situated ¾ mile south of Kelsey. Vein 4' wide in Mariposa slate. Tunnel 250' long on vein. Idle. Oscar Reeg and Blair Estate, of Placerville, owners.

Blue Bank Mine. See our Report XIII, p. 134. It is 9½ miles northwest of Shingle Springs. The vein is 18" wide, strikes N. and S., dips 74° W. in amphibolite schist. Tunnel 120' long on vein, with 100' incline below tunnel level. Idle. Murphy Bros., of Shingle Springs, owners.

Blue Rock Mine (Seam Diggings). See our Report XI, p. 203. It is $1\frac{1}{2}$ miles north of Georgetown, on porphyry seam belt. There is a zone of schists and slates traversing the formation, which is intersected by numerous gold bearing quartz seams. Idle. Flynn Bros., et al., of Georgetown, owners.

Boneset Mine. See our Report XII, p. 104. It is a prospect 6 miles north of Shingle Springs. Vein 15' wide in gabbro-diorite. Strike NE. and SW.; dip 70° N. Tunnel 140' long, crosscuts vein at depth of 40'. Idle. M. E. Gates, of Sacramento, owner.

Bordt Mine. See our Report XII, p. 104. It is a prospect $\frac{1}{2}$ mile east of Greenwood. East and west vein, dip 60° N. in slate. Idle. W. Bordt, of Greenwood, owner.

Boulder Mine. See our Report XIII, pp. 135-136. It is 8 miles northwest of Shingle Springs. Vein 8' wide in granodiorite; strike NE. and SW., dip 35° NW. Work was carried on through four tunnels. A 20-stamp mill on property. Idle. Boulder Mining Co., care F. W. Williams, 163 Crocker Bldg., San Francisco, owner.

Bower Mine (Seam Diggings). See our Report XI, p. 204. Situated at Greenwood, on the porphyry seam belt. Zone of slates and schists 30' to 100' wide, traversing the porphyry with quartz seams carrying gold. Has a reported production of \$2,000,000. Idle. California Water Co., owner.

Bright Hope Mine. See our Report XIII, p. 136. Located 1 mile northeast of Georgetown. Vein 6' wide in Mariposa slate; strike NE. and SW., dip 60° SW. Development: tunnel 400' long, shaft 80' deep. Idle. Mrs. Gibbs and W. H. Hulbert, of Georgetown, owners.

California Jack Mine. See our Report XIII, p. 136. It is 3 miles southwest of Georgetown. Vein 12' wide strikes N. and S., dip 60° E., in Mariposa slates. Developments consist of crosscut tunnel 350' to vein with drift north 200' on vein. Shaft 90' deep. Idle. Mrs. E. M. Potts and A. L. Jeffrey, 527 Citizens National Bank Bldg., Los Angeles, Cal., owners.

Cedarberg Mine. See our Reports XII, p. 106; XIII, p. 137. Located $2\frac{1}{2}$ miles northwest of Greenwood. The formation is an amphibolite schist. Vein $1\frac{1}{2}$ ' wide, strikes N. and S. and dips 57° E. Developments consist of a shaft sunk on 57° incline to a depth of 318', with levels at 100', 200', 300'. Idle. J. T. Smith, of Greenwood, owner.

Central Mine. It is situated 3 miles south of El Dorado on the Mother Lode belt. There are three parallel veins cutting the Mariposa slates, which have a general strike of $N. 10^{\circ} E.$, dipping 60° E. Developments: tunnel 800' long. Idle. Seymour Hill, of El Dorado, owner.

Chaparral Mine. It is 2 miles southwest of Kelsey. Vein 6' wide with a diabase footwall and slate hanging wall. Vein strikes NW. and SE., dip 70° E. Shaft 200' deep. Tunnel 50' long. Idle. Philip Stingle, of Boston, and Margaret Kelly, of Kelsey, owners.

China Hill Mines. See our Report XII, p. 106. It is a pocket mine situated 3 miles southwest of El Dorado. The vein occurs in a hornblende porphyry, and has average width of 5'. Strike N. and S., dip 70° E. Developments consist of crosscut tunnel 200' to vein with drifts north and south for a distance of 200', giving 130' of backs. There is a 5-stamp mill on property. Idle. China Hill Mining Co., W. M. Langtry, president; J. E. Fox, secretary, Placerville, owner.

Church Mine. See our Reports VIII, p. 191; X, p. 171; and XII, p. 106; also, Bull. 18, p. 92. This property is situated 2 miles southeast of El Dorado. Comprises two claims: Church and Golden Fleece, with 2300' on the lode. Three veins occur in the Mariposa slates. These veins have a general north and south course, and dip 74° E. The veins have an average width of 5' to 10'. The shaft has three compartments, and was sunk to a vertical depth of 1350'. The vein has been developed on 100', 200', 300', 350', 500', 600', 700', 850', 1000', and 1200' levels. The course of the Kidney vein was north and south as far as the 350' level, on which level the vein is 40' west of shaft. From the 350' to 500' level this vein dips 45° E. Below the 500' level the vein straightens up to 74° and has a course of NE.-SW. From the 500' level to surface the ore occurs in kidneys. The ore shoot from the 500' level to 1200' level is continuous, but below the 1200' level the shoot shortened up to a length of 25'. A crosscut was driven from the shaft 1400' east. On the 1200' level there is a crosscut from shaft to vein 625' east, from which point a winze was sunk on the vein to a depth of 150'. This vein showed 4' of quartz with a gouge on both walls, in the bottom of winze. The vein has been stoped out on ore shoots from 1200' level to surface. There is a double drum, water-power hoist on the property. Idle. Seymour Hill, of El Dorado, owner.

Collins & Bacchi Mine. It is a prospect near Garden Valley, comprising 126 acres of patented land. Idle. J. G. Hibbs, of Wawa, Pa., owner.

Cousin Jack Mine. See our Reports XII, p. 107; XIII, p. 138. It is situated 5 miles southwest of Grizzly Flat. Vein 12" wide occurs in the slates, with a course N.-S., dip 60° W. Developments consist of 300' upper tunnel, 250' above a lower tunnel which has a length of 400'. Idle. Mrs. M. Jeffrey, of Grizzly Flat, owner.

Crown Point Mine. See our Report XII, p. 107. It is 2 miles southeast of Diamond Springs. Three veins occur in Mariposa slate

and strike N. 27° E., dip 72° E. These veins have an average width of 4'. Developments consist of a shaft 500' deep, sunk on an angle of 72°, and a tunnel 512' long. The mine has been developed from the shaft on the 100', 200', 300', and 400' levels. The tunnel intersects shaft at a depth of 300'. Idle. James Richards, of Placerville, owner.

Crusader Mine. Situated 3 miles south of Diamond Springs, on Mathenas Creek. Comprises the following claims: The Crusader, Alta, Gibraltar, with 3000' on the lode. The vein occurs in Mariposa slates, having an average width of 3'; strike N. 20° E., dip 80° W. Shaft 100' deep sunk on 70° incline. The shaft intersects vein 50' below collar. On the 100' level a crosscut was driven west to vein, a distance of 20', with a drift north 20' and south 75'. An ore shoot 100' long with an average width of 300' was developed. Idle. Seymour Hill, of El Dorado, owner.

Crystal Mine. See our Report XII, p. 107. It is 5 miles south of Grizzly Flat. Idle. L. L. Alexander, of Omo ranch, owner.

Crystal Mine. See our Report XII, pp. 107-108. It is 3½ miles south of Shingle Springs. North and south vein with an amphibolite schist footwall and serpentine hanging wall. The vein has an average width of 3' and dips 50° E. Developments consist of incline shaft, 250' deep, and a crosscut tunnel 350' long. Idle. G. Phelps, Paul Lewis, and Barrett Bros., of Shingle Springs, owners.

Crystal Mine. See our Report XIII, p. 138. It is a prospect ½ mile north of Cool. Idle. E. Terry, C. Ashley, and C. Schulz, of Cool, owners.

Daily and Bishop Mine. See our Report XIII, pp. 138-139. It is 2½ miles south of Grizzly Flat, on Clear Creek. Idle. Bishop, et al., of Grizzly Flat, owners.

Dalmatia Mine. See our Reports X, p. 174; XI, p. 201; and XII, p. 177. Situated ½ mile east of Kelsey; on the porphyry seam belt, with an ore zone from 20' to 50' wide, which strikes N. 10° W., dip 25° E. Developments: incline shaft 200' deep, tunnel 1200' long; with an open cut 500' in length. There is a 10-stamp mill on property. Idle. William A. Bell, No. 5, "The Cliff," Black Rock, Brighton, England, owner.

Darling (Chanced Upon) Mine. See our Report XI, p. 202. It is 3 miles northeast of American Flat, in Slate Mountain Range. Vein having an average width of 2', occurs in Calaveras slate; strike NW. and SE., dip 78° E. Shaft 190' vertical. Idle. P. G. Gilpin, of San Francisco, owner.

Davidson Mine. See our Report XII, p. 108. Situated 2 miles northwest of El Dorado, at an elevation of 1700'. The vein occurs in Calaveras slates west of Mother Lode belt. The course of vein is N.

10° W., dip 74° E., and average width of 2'. An incline shaft has been sunk to a depth of 280', with drifts north and south on vein, on 100' and 200' levels. Equipment on property consists of 80 h.p. boiler, 2-drill Rix compressor, and 5-stamp mill. Idle. Central El Dorado Mining Co., Paris, France, owner.

Eagle King Mine. See our Reports VIII, p. 178; XII, pp. 108-109; and XIII, p. 139. It is located $1\frac{1}{2}$ miles northwest of Grizzly Flat, on ridge south of north fork of the Cosumnes River. The vein occurs on the contact between the granodiorite and mica schist. Strike N. 20° E., dip vertical. The quartz carries 3% sulphurets, with galena, zinc, and pyrite. Developments consist of a tunnel 1200' long and a winze from tunnel level 60' deep. There is a 10-stamp mill on property. Idle. E. W. Witmer and John Melton Estate, of Placerville, owners.

Eagle Mine. See our Report XIII, p. 139. It is $2\frac{1}{2}$ miles north of Grizzly Flat. The vein occurs in granodiorite. Vertical shaft 240' deep and tunnel 780' long. Idle. Mrs. Kate Smith and S. Kendrick, of Grizzly Flat, owners.

Edner Mine. See our Reports XII, p. 109; XIII, pp. 139-140. It is a prospect, 7 miles east of Fairplay. The vein occurs in granodiorite; strike N. and S., dip 65° W. Tunnel 150' in length, shaft 50' deep. Idle. Charles Edner, of Omo Ranch, owner.

Esperanza Mine (Seam Diggings). Situated $\frac{3}{4}$ mile east of Greenwood, on the porphyry seam belt. Idle. Paul Ricci, et al., of Greenwood, owners.

Esperanza Mine. See our Reports X, p. 175; XII, p. 109. It is 1 mile northwest of Garden Valley, on ridge west of Manhattan Creek. Vein 5' wide occurs in slate; strike N. 20° W., dip 60° E. Developments consist of vertical shaft 600' deep and tunnel 260' in length. Ten-stamp mill on property. Idle. Garden Valley Mining Co., St. Johns Bldg., Chester, England, owner.

Eureka Mine. See our Reports XI, p. 203; XII, p. 109. It is situated in the town of Georgetown. Three parallel veins occur in the Mariposa slates, which strike NE.-SW. and dip 60° E. The veins have an average width of 6' to 10'. There is an incline shaft 240' deep with 500' of drifts on veins. Idle. E. B. Lee, of New York City, owner.

Falls Mine. It is 3 miles south of Diamond Springs, on Mathenas Creek. Crosscut tunnel 200' long cutting Mariposa slates. One man employed driving crosscut tunnel to intersect vein. Joseph Diechsler, of Diamond Springs, owner.

Fisk Mine. See our Report XIII, p. 140. Situated $1\frac{1}{2}$ miles north of Placerville. Vein occurs between serpentine on west and black

graphitic slate on east. Two tunnels have been driven on vein. Idle. J. H. Skinner, of Placerville, owner.

French Mine (Seam Diggings). See our Report XII, p. 110. It is $\frac{1}{4}$ mile west of Greenwood, on the porphyry seam belt. Idle. California Water and Mining Co., owner.

French Hill Mine (Seam Diggings). See our Report XII, p. 110. It is 6 miles north of Greenwood, on porphyry seam belt. Shaft 100' deep, tunnel 100' long. Idle. A. J. Johnson and E. S. Hadley, of Sacramento, owners.

Frog Pond and Marigold Cons. Mines. These properties are situated $\frac{1}{2}$ mile north of Garden Valley. The owners are mining a series of flat seams which occur in porphyry, containing arsenical pyrites which are very rich in gold. Two men employed. S. W. Collins and C. K. Norris, of Garden Valley, owners.

Garden Gate (McNulty) Mine. See our Report XII, p. 117. It is 3 miles south of El Dorado. Shaft 400' deep, and crosscut tunnel 450' to vein, with winze from tunnel level 450' deep sunk on the vein. There is a 10-stamp mill on the property. Idle. J. B. Drury, of St. Louis, Mo., owner.

Gardner Consolidated Mine. It is 1 mile north of Placerville, on ridge east of Big Canyon Creek. The vein has an average width of 5', with a course of N. 40° E., dip 70° E. The formation is a Mariposa slate. Developments consist of crosscut tunnel 400' to vein with drifts north and south, for a distance of 500'. Idle. W. H. Myers, of Placerville, owner.

Garfield Mine. See our Report XII, p. 110. It is 1 mile south of Volcanoville. Idle. Garfield Mining Co., owner. W. C. Green, of Georgetown, agent.

Garfield & Excelsior Cons. Gold Mines. See our Report XII, p. 111. It is 1 mile northeast of Greenwood. Idle. F. H. Bilty, et al., of Greenwood, owner.

Georgia Slide Mines (see Beattie & Parsons, Blue Rock, also Mulvey Point and Pacific).

German (Haeger) Mine. See our Report XIII, p. 142, and Bull. 19, p. 90. Situated 4 miles south of El Dorado. The vein occurs in Mariposa slates, on the footwall of the Mother Lode. Strike N. 10° E., dip 60° E. Developments were carried on through a shaft 500' deep sunk on an angle of 60°. There is a 10-stamp mill on the property. Idle. Seymour Hill, of El Dorado, owner.

Gold Mountain and Monitor Mines. These properties are situated 2 miles south of Nashville. Idle. Mrs. B. E. Carter and Mrs. L. S. Santbin, of Nashville, owners.

Golden State Mine. See our Reports XI, p. 204; XII, p. 111. It is 4 miles northeast of Georgetown on the porphyry seam belt. Idle. Ida Barklage Brown, of Georgetown, owner.

Good Luck Mine. It is 2 miles east of Diamond Springs. Vein 18" wide occurs in the Mariposa slates. Strike N. 20° E., dip 45° E. Developments consist of shaft 250' deep, and two tunnels, one 200', the other 300' in length. There is a 5-stamp mill on property. Idle. Good Luck Mining Co., care Robert Mitchell, 76 Kensington, London, England, owner.

Gopher-Boulder Mine. See our Report VIII, p. 175, also Bull. 18, pp. 98-99. Situated $\frac{1}{2}$ mile north of Kelsey. The vein is 30' to 100' wide, but low grade. A shaft has been sunk on the vein 250' on an angle of 35° and a large open cut has been made in a zone of quartz and greenstone schist. A crosseut tunnel has been driven 300' to Gopher vein, and over 500' of drifting and crosscutting has been done on this vein. There is a 20-stamp mill on the property. Idle. W. A. Bell, No. 5 "The Cliff," Black Oak, Brighton, England, owner.

Grand Victory Mine. See our Reports VIII, p. 194; X, p. 178; and XII, p. 112. It is on Squaw Creek, 7 miles southeast of Placerville, at 2100' elevation, and comprises 160 acres of mineral land on which are quartz locations. The ore body is a black quartzite, lying in slate of the Calaveras formation near the granodiorite contact, striking NW.-SE. and dipping vertically. Two ore bodies developed have widths of 64' and 125', with slate intervening. Developments consist of a vertical shaft 500' deep and a tunnel 500' in length. There is a 10-stamp mill on the property. Idle. Grand Victory Gold Mining Company, care John C. Wright, of Indianapolis, Ind., owners.

Griffith Mine. See our Report XII, p. 112. It is $\frac{1}{2}$ mile southeast of Diamond Springs. Comprises the following claims: Manzanita King, Manzanita Queen, Potosi, Collar, and 180 acres of mineral land. Two shafts were sunk on the property. The north shaft has a vertical depth of 700' and the south shaft, 450'. The vein strikes N. 27° E., dip 72° E. Average width of 5'. Idle. Jumper Gold Syndicate Mining Co., Stent, Tuolumne County, owner.

Guilford (Poverty Point) Mine. It is situated $2\frac{1}{2}$ miles north of Placerville, on ridge south of the south fork of the American River. Comprises the following patented claims: Iowa, Hidden Treasure, Bantam, Baltic, Humming Bird, Poverty Point, Brighton, Bell and Fortuna, total holdings amounting to 500 acres, with 5000' on the lode. Two parallel veins occurring in the Mariposa slates have been developed on this property. These veins strike N. 20° W., with a dip of 70° E. The east vein is 30' east of west vein. These veins have an average

width of 5'. A diabase dike follows the vein and in places is highly siliceous. Two ore shoots have been developed, 200' and 400' in length, with an average width of 5'. The property has been developed through four tunnels: Iowa Tunnel, 500'; Baltic Tunnel, 1500'; Baltic No. 2 Tunnel, 600'; Poverty Point Tunnel, 700'. The ore is free milling with 3% pyrite. Compressor and mill are run by water-power, the water being obtained from the San Francisco-Oakland Terminal Power Company ditch under a head of 560' at mill.

Mill: 9"x15" Blake Crusher, 15 stamps weighing 850 lbs. per stamp, dropping 95 per minute, with 6" drop, crushing 3 tons per stamp through 20-mesh screen. The pulp from batteries after flowing over amalgamating plates, flows to three Wilfrey tables and two 4-foot Frue vanners. An extraction of 85% is made in mill, with a loss of 20¢ per ton in tailings. Concentrates have a value of \$80.00 per ton. Twenty-five men are employed. Guilford Gold Mining Co., Placerville, owner. A. Baring-Gould, president and general manager; E. W. Witmer, secretary; William Christian, superintendent.

Grouse Gulch Mine. See our Report XII, p. 113. It is $1\frac{1}{2}$ miles west of Grizzly Flat. Idle. Mrs. K. Smith, of Grizzly Flat, and I. W. Smart, of Placerville, owners.

Hillside Group of Mines. These properties are situated 4 miles south of El Dorado, comprising: Hillside No. 1, Hillside No. 2, Hillside No. 3, Hillside No. 4, Hillside No. 5, Hillside Extension, Tasmania, Chihuahua, O'Campo, Oro Blanco, Santa Fe and Bismark, a total holding of 240 acres with 7500' on the lode. Series of parallel veins occurring in the Mariposa slates, with a general strike of N. 20° E., dip 70° E. Developments: crosscut tunnel 500' long and a lower tunnel with a length of 200'. There is a 5-stamp mill on the property. Two men are employed driving lower tunnel. Hillside Mining Co., care E. E. Bender, 64 Fremont st., San Francisco, owner; W. E. Blackmer, of El Dorado, superintendent.

Idaho Mine. It is 3 miles south of El Dorado. Idle. Sidney Pringle, of San Francisco, owner.

Ida Livingston. It is a mile north of Kelsey. Idle. A. W. Craig et al., of San Francisco, owners.

Independence Mine. It is a pocket mine, 2 miles southwest of El Dorado. Idle. Independence Quartz Mining Co., 806 19th st., Des Moines, Iowa, owner.

Inez Central Mine. See our Reports XI, p. 171, and XII, p. 114. Situated 3 miles east of Nashville. Idle. S. H. Maginess, of Placerville, owner.

Isbell & Blue Lead Group. These properties are located 1 mile south of Garden Valley. On Isbell claim there is a shaft 250' deep;

on Blue Lead the shaft has a depth of 150'. Idle. M. P. Bennett, of Placerville, owner.

Ivanhoe Mine. See our Report X, pp. 175-176. It is $\frac{1}{2}$ mile northwest of Garden Valley. Idle. H. Warren Russell, of Garden Valley, owner.

Josephine Mine. See our Report VIII, pp. 165-166. It is $\frac{1}{2}$ mile east of Volcanoville. Development consists of five tunnels on the vein. Idle. J. A. Shields, of San Francisco, owner.

Kelsey Gold and Silver Mine. Situated 1 mile south of Kelsey, on ridge northwest of south fork of the American River. Lower tunnel 150', upper tunnel 400' in length. Idle. Mother Lode Mines Company of California, 32 Hancock St., Jersey City, N. J., owner.

Lady Blanche Mine. See our Report XIII, p. 147. It is $2\frac{1}{2}$ miles east of Fairplay. Idle. J. E. Stratton, of San Francisco, Cal., owner.

Lady Emma Mine. See our Report, XIII, pp. 147-148. It is 1 mile east of Kelsey. Idle. Charles E. Hand, of Placerville, owner.

Larkin Mine. See our Report XIII, p. 148, and Bull. 18, p. 93. Situated $\frac{1}{2}$ mile east of Diamond Springs. The great dolomitic vein passes through this property, in addition to which there are several other less prominent veins. It is upon one of the latter, which occurs in the hanging-wall slates of the dolomitic vein, that past operations have been conducted. This vein is accompanied by a small dike of diabase. The dolomitic veins is 80' wide, and is altered to a tale schist. West vein has a course of N. 20° E., dip 74° E., while east vein has a vertical dip. The shaft has been sunk to a vertical depth of 800'. Levels were driven north and south on the vein at 100' intervals. Over 4000' of drifts have been run in this mine. There is a 10-stamp mill on the property. Idle. Larkin Mining Co., San Francisco, owner.

Last Chance (Sugar Loaf) Mine. See our Report XIII, p. 158. It is 2 miles east of Nashville. Comprises 1427 acres of mineral ground. A shaft has been sunk on the Last Chance vein to a depth of 600' on 70° incline, also a shaft 260' deep on the Monarch vein. There is a 10-stamp mill on the property. Idle. Dr. A. C. Smith, of Portland, Oregon, owner.

Lincoln Mine (Seam Diggings). See our Report XIII, p. 148. It is $1\frac{1}{4}$ miles northwest of Georgetown, on the porphyry seam belt. Idle. M. D. Haskins, of Georgetown, owner.

Log Cabin (Darrow) Mine. See our Report XIII, p. 149. It is 5 miles southeast of Shingle Springs. Tunnel 600' long. Idle. A. Darrow, of Shingle Springs, owner.

Lone Jack Mine. See our Report X, p. 176. It is 1 mile northwest of Garden Valley. Idle. Campbell & Metson, of San Francisco, owners.

Lone Star Mine. See our Report XII, p. 116. It is 4 miles southeast of El Dorado. Comprises the following claims: Lone Star, Wild Rose, Old Abe, South Star, and Recall. A series of parallel veins in Mariposa slates, which have been developed by a crosscut tunnel 500' long. Idle. S. H. Maginess, of Placerville, owner.

Lone Star Mine. See our Report XII, p. 116. It is situated 1 mile south of Nashville. Vein 7' wide occurring in Mariposa slates; strike N. 10° E., dip 60° E. A shaft has been sunk on this vein to a depth of 100'. Idle. J. C. Heald, of Nashville, owner.

Lookout Mine. Worked as a pocket mine, and is 3 miles south of El Dorado. Idle. Seymour Hill and Grant Hill, of El Dorado, owners.

Lookout and K. K. Mines. See our Report XIII, p. 149. They are in Quartz Cañon, 1 mile south of Volcanoville, and comprise two claims. Idle. Wilson Cary, of Georgetown, owner.

Loveless Mine. It is a pocket mine, situated 4 miles south of El Dorado. Vein of quartz 12" wide occurs in a casing of slate in diabase, and strikes north and south, dip 47° W. Developments consist of a crosscut tunnel 160' to vein, with drift north and south on the vein for a distance of 300'; also a shaft 90' deep. Two men employed. L. T. Loveless & Bros., of El Dorado, owners.

Lucinda Mine. See our Report XIII, p. 149. It is 3 miles west of Grizzly Flat. East and west vein in granodiorite. Idle. Mrs. Nail and D. Gallagher, of Grizzly Flat, owners.

Lucky Jack Mine. It is 2 miles south of El Dorado. There is a series of blanket veins which strike north and south in granodiorite. Work is carried on through a series of shallow shafts. Two-stamp mill on the property. Two men employed. Thomas Murphy, of Logtown, owner.

Lucky Marion Mine. See our Report XIII, p. 150. It is $\frac{1}{2}$ mile west of Greenwood. Idle. Lucky Marion Mining Co., of St. Louis, Mo., owner.

Mameluke Hill Mine (Seam Diggings). It is 1 mile north of Georgetown, on ridge south of Cañon Creek. Idle. Mameluke Hill Mining Co., Ira Vaughn & Son, 36th St. and San Pablo Ave., Oakland, Cal., owners.

Mammoth Mine. See our Report XIII, p. 150. It is a prospect, located 8 miles northwest of Shingle Springs. There is a 10-stamp mill on the property. Idle. Jasper Jurgens, of Lotus, owner.

Manhattan-California Mine. Situated 2 miles northeast of Nashville. Comprises 77 acres of mineral land. Shaft 400' deep. Idle. Manhattan-California Mining Co., W. T. Hyatt, of Sacramento, owner.

Marguerite Mine. It is situated 4 miles south of Placerville. Three parallel veins have been developed in slate of Mariposa formation, which strike north and south and dip 70° E. Developments consist of a vertical shaft 300' deep, and a tunnel 200' in length, with 1200' of drifts on veins. Equipment: 80 h.p. boiler, single drum hoist and Rix compressor. Idle. Marguerite Mining Company, care W. W. Tenney, secretary, 510 Battery St., San Francisco, owner.

Mathenas Creek (Schneider) Mine. See our Reports VIII, p. 190; XI, p. 172; XII, p. 117. It is 2 miles south of Diamond Springs. Idle. Mathenas Quartz Mines and South Co., owner.

Melton Mine. See our Reports VIII, p. 177; XII, p. 117. It is 2½ miles northeast of Grizzly Flat, on ridge south of the north fork of the Cosumnes River. Idle. Isaac P. Lampson, of Cleveland, Ohio, owner.

Miller (Ribbon Rock) Mine. It is a prospect, 2½ miles south of Placerville. Idle. Moses Miller, of Placerville, owner.

Montana Mine. See our Report XIII, p. 151. It is 1 mile south of Volcanoville, on ridge north of Otter Creek. Idle. J. Helmers et al., of Georgetown, owners.

Montezuma Mine. See our Reports XII, p. 118; XIII, p. 151; also Bull. 18, p. 91. Situated ½ mile north of Nashville, on slope of ridge east of the north fork of the Cosumnes River. Comprises the following claims: Mariposa, Montezuma, East Montezuma and North Extension of the Montezuma. The vein occurs in the slates of the Mariposa formation. The vein has an average width of 7', with a course of N. 20° E., dipping 57° E. A two-compartment 4'x10' shaft has been sunk on an angle of 57° to a depth of 440'. Three levels have been driven on vein. On 160' level there is a drift 200' S. and 90' N. On 360' level drift N. 330' and S. 400'. There is a drift from the Havilah shaft on the 1200' level, 1285' N. into the Montezuma claim. Equipment: Giant compressor, single drum hoist, driven by 55 h.p. motor, and a 10-stamp mill. This property is under bond to the California Exploration Co., who propose to sink the 2-compartment shaft to the 1200' level of Havilah shaft. Electric power is furnished by Western States Power Co. Water is obtained from the north fork of the Cosumnes River by a ditch 1½ miles long, capacity of 1800 miner's inches. Idle. J. C. Heald, of Nashville, owner.

Morey Mine. See our Reports VIII, p. 178; X, p. 178; and XII, p. 118. It is 1 mile west of Grizzly Flat. Idle. E. R. Morey, of Grizzly Flat, owner.

Mount Hope Mine. See our Report XIII, p. 178. It is 3 miles north of Grizzly Flat, on ridge north of north fork of the Cosumnes River. Idle. Sierran Mining Co., care Judge Wildman, of Norwalk, Ohio, owner.

Mount Pleasant Mine. See our Reports VIII, p. 178; X, p. 178; and XII, p. 118. This property is situated $\frac{3}{4}$ mile west of Grizzly Flat. Controls 259 acres of mineral ground, which gives 5156' on the lode. The mine is on the east belt, which is well defined by a succession of quartz veins. The belt at the Mount Pleasant is 300' wide, dips vertical, strikes N. 13° E. The three largest veins strike diagonally through the lode, at small angles of from 2° to 10° from the NE.-SW. strike of the lode. These quartz veins are in the granodiorite or along its contact with the mica schist and in the mica schist northerly from the contact line of the formation. The quartz veins in the mica schist, east of the granodiorite formation, at the southern end of the property have the same strike as the lode. The three principal quartz veins are very nearly parallel in strike, but do not overlap. Each has one or more spurs and lesser parallel veins, and is thus, itself, the center of a small vein system. The quartz bodies of the veins are lenticular masses. The ore is concentrated in shoots. The quartz contains free gold, galena, zinc blende and pyrite. The three principal veins are called the Earl, McKane, and Big Vein. A shaft has been sunk to a depth of 1065' on the vein, with levels driven on the vein at 100' intervals. Workings amount to over 9000' of drifts. On 1000' level there is a drift 750' north. This level is being continued north to intersect ore shoots that have been stoped out from 700' level to surface. Equipment consists of hoist, compressor, and 10-stamp mill. Twelve men are employed. Mount Pleasant Cons. Gold Mining Co., Merchants Exchange Bldg., San Francisco, owner; Larry King, superintendent.

Mulvey Point and Pacific Mines (Seam Diggings). These properties are situated 1 mile north of Georgetown, on porphyry seam belt. Idle. Ida Barklage Brown et al., of Georgetown, owners.

Nashville (Havilah) Mine. See our Reports XII, p. 119, and XIII, p. 151. Situated at Nashville on the north fork of the Cosumnes River. Comprises the following claims: Havilah, East Havilah, Northeast Nashville. A vein from 5' to 20' wide occurs in the slates of the Mariposa formation. Strike N. 10° E., dip 60° E. A shaft has been sunk on this vein to a depth of 1200' with levels at 100' intervals. The 1200' level was driven north 1500' into the Montezuma claim, which joins this property on the north. The ore is free milling with 2% pyrite. This property is under bond to the California Exploration Co., of London,

England, who plan to work it in conjunction with the Montezuma Mine. Idle. Joshua Hendy Machine Works, San Francisco, owner.

New El Dorado Mine. See our Report XII, p. 119. It is $2\frac{1}{2}$ miles northeast of Greenwood. Idle. W. N. Martin, of Oakland, owner.

New Garibaldi Mine (Seam Diggings). See our Report XIII, p. 152. It is $2\frac{1}{2}$ miles west of Greenwood on the porphyry seam belt. Idle. J. B. Hayes, of San Francisco, owner.

Oak Mine. See our Report XII, p. 119. It is 5 miles southwest of Grizzly Flat. Idle. J. Ryan, of Grizzly Flat, owner.

Ohio Mine. See our Report XIII, p. 152. It is 1 mile east of Greenwood. Idle. B. W. Katzenstein, of Sacramento, owner.

Omo Mine. See our Report XIII, p. 152. Situated 8 miles east of Fairplay. Idle. G. W. Mock, of Omo ranch, owner.

One to Sixteen and Vulture Mines. They are 1 mile north of Placerville. Idle. W. A. Craddock, of Placerville, owner.

Oriflamme Mine. See our Reports VIII, p. 189; XI, p. 172. It is 3 miles east of Diamond Springs. Idle. S. H. Maginess, of Placerville, owner.

Oro Fino (Big Cañon) Mine. See our Reports VIII, p. 174; XII, pp. 103, 479; and XIII, p. 133; also Bull. 18, p. 96. It is situated 5 miles south of Diamond Springs, in Big Cañon. The vein, which is 40' wide, consists of a dike-like mass of diabase breccia which has become silicified and impregnated with finely disseminated auriferous pyrite. Many small seams of calcite traverse the rock in every direction. Both hanging and footwall are diabase, but little altered even in close proximity to the vein. A vertical shaft has been sunk to a depth of 200' where it turns to an incline of 40° , and continues to a depth of 540' on the vein. The dike strikes north and south and dips 40° E. There are levels on the vein at 100', 200', 300', 500', and 700'. The ore has been stoped out from the 500' level to surface for about 200' north and south of the shaft. The values in the ore are in the sulphides, which contain about 3% auriferous pyrite. The present work is confined to development operations on the 700' level. A 5-drill Rix compressor driven by water power furnishes air for machine drills and single drum hoist. The property is under option to the Tredwood Syndicate, Ltd., of London, England. Twelve men are employed. Hayward, Hobart and Lane Estates, Merchants Exchange Bldg., San Francisco, owner. C. H. James, general manager; C. C. Marsh, superintendent.

Pacific Mine. See our Reports VIII, p. 183; X, p. 173 and XII, p. 120. This mine which is situated at Placerville, comprises the following claims: Epley, Crescent, Webber, Farraday, Henrietta, Albright

Mill Site, Webber Placer Mine, Excelsior Placer Mine, Albright Placer Mine, Oregon Hill, Pacific, Maryland, Rose, North Atlantic, Climax, Chester, Ida Mitchell, Keegan, Davey, Young, Harmon, Old Harmon, Franklin Placer Mine, Gross, Van Hooker, Eureka, Brown Bear, White Bear, Cinnamon Bear, Grizzly Bear, Spanish Hill Placer, and Texas Hill Placer mines. The quartz mines extend a mile south of the American River to Webber Creek, a distance of three miles. The hydraulic and placer mines are located in Chili Ravine and on Spanish and Nigger Hills. The total holdings of the company amount to 1400 acres, with $4\frac{1}{2}$ miles along the lode. The veins run parallel to the Mariposa slates, or cut them at an acute angle. The Pacific vein occurs in a zone of ankerite and mariposite which zone is 300' wide on the 700' level. By a series of diamond drill holes this ankerite zone was shown to have narrowed up to a width of 125' on the 2000' level. The Pacific vein strikes N. 25° W., dipping 70° E., and is from 4' to 12' wide. This vein was lost on the 700' level and appears to have been faulted to the east between the 300' and 400' levels. The ore is free milling with 2% pyrite. During the past year an extensive prospecting campaign was prosecuted with diamond drills to determine if the ore bodies continued in depth, but the results were unsatisfactory. Over 8000' of diamond drill holes were driven from the winze at the 1700' and 2000' stations. At the 1700' station, 3 holes were driven at different points, from 600' to 700' in length. On the 2000' station 8 holes were driven in a fan shape from 300' to 1200' in length, but results obtained were not very encouraging; therefore this method of prospecting was abandoned. A vertical shaft has been sunk to a depth of 700'. About 200' north of this shaft a winze was sunk on a 70° incline to a depth of 1365'. The shaft was sunk in the black slate footwall to the 700' level, cutting the Pacific vein on the 300' level. The winze from 700' level is in black slate footwall from 1600' to 2000' levels. An extensive amount of drifting has been done on 100', 200', 300', 400', 500', 600', and 700' levels. Drifts: on 300' level, N. 200'; on 500' level, N. 1000', and S. 1500'; on 700' level, N. 1200' and S. 250'. All the above work was on the Pacific vein. On the 700' level about 220' north of crosscut from shaft to Pacific vein a crosscut has been driven 85' east, which encountered a tale ore body, 75' long and 7' wide. This crosscut was continued 130' into black slate hanging wall, but no ore was encountered. All the present work is confined to stoping operations on the tale ore body.

Mine equipment: Double drum flat rope hoist driven by waterpower, $22\frac{1}{2}'' \times 14'' \times 18''$ Laidlaw-Dunn Gordon compressor. A 5-stamp mill crushes 3 tons per stamp through 30-mesh screen; concentrates are saved on a No. 4 Deister table. Water for power is obtained from the San Francisco-Oakland Terminal Power Co. ditch. The Pacific

mine is at present under lease to P. D. Burdt and J. W. Santa, of Placerville, who are milling the ore from dumps and from the talc ore body developed on the 700' level. Eight men are employed. Placerville Gold Mining Co., Placerville, owner; president, Alexander Baring; secretary and general manager, A. E. May.



Pacific Mine, Placerville, El Dorado County. A view of hoist and 5-stamp mill.

Philadelphia and Gold Note Mines. See our Reports XII, p. 120; XIII, p. 153. They are situated 8 miles south of Grizzly Flat, comprising the following claims: Gold Note, Philadelphia, White Hall, Woolara. There is a 10-stamp mill on the property. Idle. J. B. Polk and Parker Bros., of Omo ranch, owners.

Pocahontas Mine. See our Report XIII, p. 154. It is 4 miles south of El Dorado. All machinery has been dismantled and sold. Shafts are caved. Idle. Quincy I. Chase, of San Francisco, owner.

Polar Bear, White Bear and Empire Group. They are situated 3 miles south of Grizzly Flat. Idle. J. Q. Wrenn, G. H. Werntz et al., of Placerville, owners.

Pyramid Mine. See our Reports XII, p. 121; XIII, p. 154. It is 4 miles northwest of Shingle Springs. Idle. Pyramid Mining Co., Auzerais Bldg., San Jose, owner.

Rainbow Mine. It is a prospect, $1\frac{1}{4}$ miles west of Garden Valley. Idle. J. Ramsdell and C. M. Root, of Garden Valley, owners.

Red Hill Mine. Situated 2 miles northwest of Garden Valley. A vein 10' wide occurs in the Mariposa slates; strike N. 20° W., dip 70° E. An incline shaft has been sunk on the vein to a depth of 100' and vein drifted on 350° . The ore is free milling with 2% pyrite. Five

men are employed on development work. There is a 2-stamp mill on the property. Red Hill Mining Co., St. Louis, Mo., owner; W. Gill, superintendent.

Red Wing Mine. Situated 3 miles south of El Dorado. A vein 5' wide occurs in the slates of the Mariposa formation; strike N. 10° E., dip 70° E. The vein has been developed by two tunnels, an upper 125' long, and a lower crosscut tunnel 525' in length; at a point 450' from portal of tunnel a vein 6' in width was cut, which is in the form of a stringer lead. A drift is being driven north of this vein. This tunnel gives 260' of backs on the vein. Five men are employed. W. H. James, J. E. Lawyer, P. J. Loveless, of El Dorado, owners. The property is under bond to W. F. Deaner, of San Francisco, J. I. Noce, superintendent.

Richmond Mine. It is 8 miles east of Fairplay. There is an 8-stamp mill on property. Idle. E. W. Witmer, of Placerville, owner.

Rising Sun (Potter) Mine. It is 1 mile northwest of Kelsey. Idle. R. Filippini Estate and A. Forni, of Placerville, owners.

River Hill (Gentle Annie) Mine. (For Gentle Annie Mine see our Reports X, p. 177, and XII, p. 111. For River Hill Mine, see our Report XIII, p. 141.) The property is situated 1½ miles north of Placerville. Comprises the following claims: Belle, Logan, Jackson, Lyon, Bona Sate, Gentle Annie, Hall, Surplus, Lucky Star, Sobrante, Independent, Keystone, New Era, also mineral rights to 160 acres of adjoining land. The vein strikes N. 25° W., dipping 72° E. It has an average width of 5' occurring in the slates of Mariposa formation. A shaft has been sunk on the vein to a depth of 1550'. The Gentle Annie shaft has a depth of 600' on the vein. All machinery has been dismantled and sold. Both shafts are caved. Idle. G. M. Clark, of Stockton, owner.

Rosecranz Mine. See our Reports VIII, p. 171; X, p. 176. It is 1 mile northwest of Garden Valley. Idle. H. S. Morey, Richard Rowland and R. Filippini, of Placerville, owners.

Ryan Mine. It is 1 mile south of Kelsey. Idle. M. B. Ryan of Placerville, and Barrett Bros., of Shingle Springs, owners.

Selby Mine. It is 4 miles south of Placerville. A vertical shaft has been sunk to a depth of 240'. Idle. Warren Larkin, of Placerville, owner.

Shan Tsz Gold (Shaw) Mines. See our Reports VIII, p. 193; X, p. 181; and XII, pp. 114 and 481. Situated 2 miles northwest of El Dorado, on ridge north of Dry Creek. The ore body is in the form of a quartz schist dike 100' wide, occurring in contact with metamorphics and slates of the Calaveras formation. The general strike

of this dike is N. 10° E., and dips 85° E. The ore is free milling with 3% pyrite. Rich pockets of free gold are found on contact of dike with the surrounding formation. Developments consist of shaft 135' deep and tunnel 400' long crosscutting the dike. Drifts have been driven N. 200' and S. 300' on the footwall contact. The tunnel gives 150' of backs and the ore is being mined from open cut above tunnel level. Ore is trammed from tunnel to mill and dumped over 2" grizzly, the coarse material being crushed through a Feldsmiths No. 3 gyratory crusher. From mill bins the ore is fed to three 10-foot Lane mills, each driven by a 25 h.p. motor. Capacity of mill is 150 tons per 24 hours. Twenty-five men are employed. H. DeC. Richards, 621 Crocker Bldg., San Francisco, owner; Willis Lawrence, superintendent.



Shaw Mine, El Dorado, El Dorado County, showing mill.

Slager Mine. See our Report XII, p. 123. It is 4 miles north of Greenwood, on ridge south of middle fork of the American River. Idle. William Roush & Co., of Greenwood, owner.

Sherman Mine. Situated 1 mile north of Placerville on ridge south of Big Cañon Creek. Comprises 70 acres of mineral ground. The vein occurs in the slates of the Mariposa formation, and has an average width of 5'; strike N. 20° W., dip 74° E. A shaft has been sunk on an angle of 74° to a depth of 750', and 1250' north of the shaft on 750' level a winze has been sunk on the vein to a depth of 350'. On the 100' level, drift N. 100' and S. 150'; on 200' level, drift N. 700' and S. 100'; on 300' level, drift N. 700' and S. 150'; on 400' level, drift N. 1400'; on 500' level, drift N. 900' and S. 150'. Two pay shoots were developed which had a length of 60'. These shoots had a

trend 38° north. The ore is free milling with 3% pyrite. The equipment on property consists of: double drum hoist, and Giant air compressor driven by 125 h.p. motor. Mill: two $10'' \times 20''$ Blake crushers, 10 stamps weighing 1000 lbs. per stamp, 3 Wilfrey tables and two Frue vanners. Electric power was secured from the Western States Power Company. Idle. John Wright, of Indianapolis, Indiana, owner. G. M. Clark, of Placerville, agent.



Sherman Mine, Placerville, El Dorado County. A view of headframe.

St. Clair Mine. It is 1 mile northwest of Kelsey. Idle. John Peters and Thomas Gregory, of Kelsey, owners.

St. Lawrence Mine. See our Report XI, p. 202. Situated 2 miles northeast of Kelsey. Vein 6' wide occurs in the slates of the Mariposa formation; strike N. 10° W., dip 60° E. An incline shaft has been sunk to depth of 900' with a winze from 900' level 200' deep. Idle. Mierson Banking Company, Placerville, owner.

Starlight Mine. See our Report XII, p. 157. It is $2\frac{1}{2}$ miles south of El Dorado. Vertical shaft 500' deep. Idle. Starlight Mining Co., 206 Sansome St., San Francisco, owner.

Stillwagon (St. Lawrence) Mine. See our Reports X, p. 179; XII, p. 123. It is 7 miles east of Fairplay. Idle. S. A. Laine, of Omo ranch, owner.

Stuckslager Mine. See our Reports VI, Part II, p. 43; XII, p. 124; and XIII, p. 158. It is 1 mile south of Lotus. Idle. W. B. McKinney and C. H. Grube, of Lotus, owners.

Sunday Mine. It is $1\frac{1}{2}$ miles northwest of Grizzly Flat. Tunnel 600' long. Shaft 110' deep. Idle. E. W. Witmer and John Melton Estate, Placerville, owners.

Sunrise Mine. It is 1 mile northeast of Kelsey. Idle. Mrs. Cora Grady, 311 N. 3d St., Victor, Colo., owner.

Superior (Tin Cup) Mine. See our Reports VIII, p. 187; X, p. 172. There is a shaft on the property, 400' deep, sunk on an angle of 74°. Equipment: 60 h.p. boiler, single drum steam hoist. Idle. W. H. Martin, of San Francisco, owner.

Taylor (Idlewild) Mine. See our Reports VIII, p. 168; X, p. 176; XI, p. 205; XII, p. 113; and XIII, p. 145. Situated 1½ miles northwest of Garden Valley. Vein strikes northwest and southeast, dip 50° NE. and occurs on contact of a narrow belt of amphibolite schist and slate. Shaft 1200' deep, sunk on an angle of 50°. Idle. W. E. Deane, of San Francisco, owner.

Treat Mine. See our Reports VIII, p. 178; XIII, p. 179. It is 2½ miles north of Grizzly Flat. Idle. Mrs. John D. Treat, of Oakland, owner.

Trench (Yellow Jacket) Mine. See our Report XII, p. 125. It is 1 mile south of Volcanoville. Idle. Mrs. Kate F. Lewis, Ithaca, N. Y., owner.

Tullis (Diamond) Mine. See our Report XIII, p. 159. Situated 2½ miles south of Diamond Springs. Idle. Tullis Mining Co., San Leandro, Alameda County, owner.

Union (Springfield) Mine. See our Report VI, Part II, p. 43. It is situated 3 miles south from El Dorado, at 1180' elevation, and comprises the following claims: Honey Ranch, Alabama, Union Clement Placer, Lot 4. Location giving 1300' on lode; five veins occurring in the slates of the Mariposa formation have been proven on this property. Their general strike is N. 16° E., dip from 60° to 79° E., with an average width of 5' to 10'. Four ore shoots were developed from 100' to 250' in length. The Springfield shaft has been sunk to a vertical depth of 1640'. This shaft is located 320' east of vein, the hanging wall vein crossing the shaft at 1200' level, while the west gouge vein intersected the shaft about 60' above 1600' level, and lies about 15' east of shaft. Over 21,000' of crosscuts and drifts have been run on this property from the Springfield and Clement shafts, the latter shaft being 900' deep, sunk on an angle of 70°. The production from this mine is reported to have been in the neighborhood of \$5,000,000. The ore is free milling with 1½% to 2% pyrite. The ore shoots developed have been stoped out from the 1300' level to the surface. There is a 20-stamp mill on the property. Twenty men employed on development under supervision of H. H. Lang, consulting engineer. John A. Finch Estate, owners. Chas. Hussey, agent, 507 Empire State Bldg., Spokane, Washington.

Vandergreft Mine. It is 3 miles north of Nashville. Incline shaft 250' deep. Tunnel 100' long. There is a 10-stamp mill on the property. Idle. J. P. Vandergreft, of Placerville, owner.

Vann Mine. See our Report XIII, p. 161. It is $\frac{1}{2}$ mile north of Georgetown. Idle. W. L. Dickerson, of San Francisco, owner.

Webster Mine. See our Report XII, p. 126. It is $2\frac{1}{2}$ miles northeast of Georgetown. Idle. D. C. Webster, of Georgetown, owner.

Welch Gold Mines. See our Report XII, p. 126. Located $\frac{1}{2}$ mile northeast of Greenwood. Idle. Henry Welch Mining Co., San Francisco, owner.

Wilhelm and Last Chance Mines. They are 8 miles southeast of Auburn, Placer County, on ridge east of north fork of the American River. Idle. G. E. Lukens, of Auburn, owner.

Woodland Mine. This property is located 3 miles east of El Dorado, on Mathenas Creek. Vein 12" wide occurs in the slates of the Mariposa formation. Strike N. and S., dip 80° E. The ore is free milling with 2% pyrite. A vertical shaft has been sunk to a depth of 200' and levels driven on the vein at 100' and 150' from collar of shaft. Mill: 5 stamps, weighing 1000 lbs. per stamp; one Wilfrey table. The mill is driven by 25 h.p. gasoline engine. Six men are employed. Woodland Mining Co., Sacramento, owner; C. Willhite, president; F. Smith, secretary; Edward Hollinsworth, superintendent.

Woodside Mine. Situated at Georgetown, comprising the Iowa, Brooklyn, Eureka, and Woodside mines. Vein 3' wide in slate, strikes N.-S. and dips 60° E. A shaft has been sunk on vein to a depth of 210'. Idle. Woodside-Eureka Mining Co., Bacon Bldg., Oakland, owner.

Zentgraf Mine. See our Reports VIII, p. 200; XIII, pp. 161-162. Situated 8 miles east of Newcastle, Placer County, on the north fork of the American River. Idle. P. C. Drescher, of Sacramento, owner.

GOLD MINES—PLACER.

Since our last report very little activity has been shown in mining the auriferous gravel deposits of the ancient river channels that are located in the vicinity of Placerville, Georgetown, Volcanoville, Grizzly Flat, Henry Diggings, Omo House and Indian Diggings. These gravel deposits have been extensively mined in the past and have a large record for production of gold.

Alveoro Gravel Mine (Drift). Situated 3 miles east of Placerville. The channel has a north and south course. The gravel is partially cemented and capped by 300' of andesitic tuff. The channel is 100' to 300' wide, with a depth of gravel from 6' to 30'. A tunnel 4000'

long has been driven on main channel; there are two incline shafts from 400' to 500' deep. Idle. S. H. Maginess, of Placerville, owner.

Armstrong & Roberts Gravel Mine (Drift). See our Report XII, p. 101. Situated $3\frac{1}{2}$ miles south of Grizzly Flat. Idle. W. T. Armstrong, of Grizzly Flat, owner.

Badger Hill Placer Mine (Drift). Situated 7 miles northeast of Placerville. Idle. George Riever, of Placerville, owner.

Benfelt Placer Mine (Drift). See our Reports VIII, p. 197; XII, p. 179. It is 2 miles east of Placerville. Idle. J. D. Benfelt, of Smith's Flat, owner.

Blacklock Mine (Drift and Hydraulic). See our Report XIII, p. 134. Situated $1\frac{1}{2}$ miles northeast of Placerville. Idle. S. H. Maginess, of Placerville, owner.

Buckeye Hill Gold Mine (Drift). See our Report XII, p. 105. It is 9 miles northeast of Georgetown. Idle. Ida Barklage Brown et al., of Georgetown, owners.

California Mohawk Mining Co's. Mines (Drift). They are located at Fairplay, comprising the following placer claims: Bean Hill, Jolly Annie, Fairplay, Betty Wolly, River Hill, Blue Stocking, with three miles along the channel. Idle. California Mohawk Mining Co., 206 J St., Sacramento, owners. D. A. Disbrow, of Sacramento, agent.

Cañon Creek Fluming Company's Mine (Drift). See our Reports XII, p. 105; XIII, p. 142. It is 3 miles northwest of Georgetown. Comprises 300 acres of patented mineral land, and 4 miles of the bed of Cañon Creek below Georgia Slide. Idle. Gold Bug Mining Co., Cleveland, Ohio, owner.

Channel Bend Mine (Drift). See our Report XIII, p. 137. Situated 10 miles northeast of Georgetown, on the middle fork of the American River. Idle. Channel Bend Mining Co., San Francisco, owner.

Confederate Mine (Drift). See our Report XIII, p. 138. It is $2\frac{1}{2}$ miles southwest of Fairplay, at 2725' elevation, and comprises 40 acres. Idle. D. M. Dunn and A. F. Gillespie, Fairplay, owners.

Dividend Placer Mine (Ground Sluicing). See our Report XIII, p. 108. It is $2\frac{1}{2}$ miles west of Shingle Springs. Idle. H. D. C. Hodgkins, of Shingle Springs, owner.

Franklin Placer Mine (Drift). See our Report XIII, pp. 140-141. It is $2\frac{1}{2}$ miles east of Placerville, on the Coon Hollow Channel. Idle. Dr. W. W. Stone and J. Q. Wrenn, of Placerville, owners.

Gignac Mine (Drift). Situated on Texas Hill, near the town of Placerville. Idle. Dr. W. W. Stone, of Placerville, owner.

Giltedge Mine (Drift). See our Report XIII, p. 142. It is 3 miles south of Fairplay, on ridge south of Cedar Creek. Idle. Norton & Amsden, of Omo, owners.

Gold Channel Mine (Drift). See our Report XII, pp. 114, 115, 117, 118. Situated 8 miles northeast of Georgetown, comprising the following placer claims: Kentucky Flat, Norris Consolidated Placer Mine, Mississippi, Kenna and Morgan. Total holdings. 2134 acres. Idle. Gold Channel Mining Co., care W. H. Foss, 159 Lincoln St., Boston, Mass., owner.

Gray Eagle Cliff Mine (Drift). See our Report XII, p. 112. Situated near Volcanoville, comprising 100 acres of mineral land. Idle. D. C. Webster, of Georgetown, owner.

Grizzly Flat Placer Mine (Drift). See our Report XIII, p. 144. Located at Grizzly Flat. Idle. L. Gilson, of London, England, owner.

Hayward (Indian Diggings) Mine (Drift). See our Report XIII, p. 145. Situated at Indian Diggings, and comprises 358 acres. Idle. Hayward, Hobart & Lane Estates, Merchants Exchange Bldg., San Francisco, Cal., owner.

Horseshoe Flat Mine (Drift). Situated $2\frac{1}{2}$ miles east of Newtown, comprising the following claims: Maginess, Eureka, Laura Hill, Horseshoe. Total holdings of 400 acres. Idle. S. H. Maginess, of Placerville, owner.

Kumfa Placer Mine (Drift). It is 2 miles east of Placerville at Smith's Flat. Idle. W. P. Carpenter, of Smith's Flat, owner.

Linden Placer Mine (Drift). See our Reports VIII, p. 196; XII, p. 115. It is 1 mile southeast of Placerville on the Coon Hollow channel. Comprises the following placer claims: Cedar Springs, Globe, Linden, Confidence, with total holdings of 150 acres. Idle. Linden Mining Company, Boston, Mass., owner.

Mooney Placer Mine (Drift). See our Report XII, p. 118. It is 8 miles east of Placerville. Idle. C. P. Winchell, of Placerville, owner.

Mount Gregory Mine (Hydraulic). See our Report XIII, p. 151. Situated 3 miles east of Volcanoville on ridge north of Missouri Cañon. Idle. A. Phelps and Porter, of Georgetown, owners.

Payne Gravel Mine (Drift). See our Report XII, p. 120. It is 3 miles south of Grizzly Flat on ridge south of Clear Creek. Idle. J. M. McClean, of Grizzly Flat, owner.

Potts and Maginess Mine (Drift). Situated $\frac{3}{4}$ mile east of Newtown. Comprises 100 acres of mineral ground on the Newtown channel. Idle. S. H. Maginess et al., of Placerville, owners.

Rising Hope Gravel Mine (Drift). Situated 3 miles southeast of Placerville on Texas Hill. Comprises 218 acres of mineral land. The ancient river channel has a north and south course. The channel is capped with 300' of andesite tuff. The gravel is cemented, has a depth of 2' to 7', and the channel is about 700' in width. A tunnel has been driven 1700' in slate bedrock to tap the channel, and over 7000' of development drifts have been driven on the property. The mine is on the junction of the Newtown and Smith's Flat channels. At present writing, driving the tunnel to tap the main channel and grading for a mill. Reported that a large tonnage of good grade gravel has been developed. Ten men are employed. S. M. Warren Company, Exchange Place, New York City, owner; G. W. Englehart, general manager; Charles Hansen, superintendent.

Riveria Placer Mine (Drift). It is $\frac{1}{4}$ mile east of Placerville on Coon Hollow channel. Idle. Dr. J. Q. Wrenn, of Placerville, owner.

Stewart Mine (Drift). See our Reports X, p. 180; XII, p. 123. It is $1\frac{1}{2}$ miles southeast of Placerville. Idle. Ideal Mining Co., 2111 Fifth St., San Diego, owner.

Toll House Mine (Drift). See our Report X, p. 179. Situated 3 miles northeast of Placerville on ridge north of Rock Creek. Comprises the following placer claims: Hook and Ladder, Henry Clay, Cowan; total holdings, 134 acres. Idle. Selah Chamberlain, of San Francisco, owner.

Try Again Placer Mine (Drift). It is $3\frac{1}{2}$ miles east of Placerville. Idle. Charles Varozza, of Placerville, owner.

Union Gravel Mine (Drift). Situated $2\frac{1}{2}$ miles east of Placerville, on ridge north of White Rock Creek. The channel has a course of NE.-SW. and is capped with andesitic tuff 100' thick. The character of gravel is blue cemented with quartz boulders. Depth of 6" to 4', with a width of 400'. Developments consist of two incline shafts 412' and 285' deep. Idle. Union Consolidated Gold Mining Co., Placerville, owner. J. E. Fox, of Placerville, agent.

Zimmerman Mine (Drift). Situated 1 mile south of Pacific on ridge south of south fork of the American River. Comprises 240 acres of mineral land. Four men are employed on development work. Pre-volcanic Channel Gold Mining Co., Placerville, owner; J. H. Zimmerman, of Placerville, manager.

LIME AND LIMESTONE.

Alabaster Cave Lime Quarry. See our Bulletin 38, pp. 67-68. Situated 7 miles east of Newcastle, Placer County, on ridge southeast of the middle fork of the American River. The limestone lies in a stratum 50' thick enclosed by mica schist. The character is crystalline, granular, white, clouded white and blue limestone. Quarry 50' deep by 300' long, by 50' in width. Idle. W. T. Holmes Lime Company, Monadnock Bldg., San Francisco, owner.

Cave Valley Limestone Quarry. See our Bulletin 38, p. 68. Situated 9 miles east of Newcastle, Placer County. The limestone is crystalline, granular, white, clouded white, and blue in color. Idle. H. Cowell, of San Francisco, owner.

Mountain Quarries, owned by the Pacific Portland Cement Company, F. G. Drum, president; F. E. Erline, secretary; offices, 832 Pacific Bldg., San Francisco.

The Mountain Quarries are situated 6 miles northeast of Auburn, on the ridge south of the middle fork of the American River. The limestone occurs in the form of a lens in amphibolite schist. The general strike of this lens is north and south. The width of the deposit is from 300' to 400'. Its depth has been proven to be 800 feet by means of diamond drill holes. The limestone is worked from an open quarry, the broken material falling through a 600' shaft to ore bins in a tunnel, from which it is trammed a distance of 620 feet to storage bins located on the line of the Southern Pacific Railroad. The broken rock is shipped to the company's cement plant located at Cement, near Fairfield, Solano County. About 1200 tons a day are shipped from the quarries to this plant. 100 men are employed.

MARBLE.

Bind & Company, of Placerville, own a deposit of marble 2 miles south of placerville on Webber Creek. The color is white, mottled and blue gray. Undeveloped.

Hayward, Hobart and Lane Estates of San Francisco own a deposit of crystalline limestone at Indian Diggings, which is undeveloped on account of its distance from transportation.

MINERAL SPRINGS.

The following brief descriptions are taken from U. S. Geological Survey Water Supply Paper No. 338, 1915:

Glen Alpine Springs. Two cold carbonated springs, located 7 miles south of Tallac near Lake Tahoe appear to issue from granite at an elevation of 6850'. Cottages and tents provide accommodation for 100 guests. Owned by Mrs. J. E. Gray, Mrs. G. W. Pierce and Mrs. J. L. Ramsay. For an analysis of the water see U. S. Geological Survey Water Supply Paper No. 338, p. 236, 1916.



View of quarry and loading bins, Mountain Quarries, El Dorado County. Pacific Portland Cement Co., owners. Photo by C. A. Waring.

Rubicon Springs. Four cold carbonated springs are located 12 miles west of south of McKinney in the region of Lake Tahoe. They issue from granodiorite at an elevation of 6060' on the east side of the Rubicon River. A small hotel and three log cabins provide accommodations for guests. Owned by R. Colwell of McKinney.

A **Sulphur Spring** issues beside the American River, near Kyburz station between Placerville and Lake Tahoe at an elevation of 4000'. It is near the junction of the Silver and South forks of American River. Used locally for drinking purposes.

Three **Sulphur Springs** issue from the south side of Rubicon River below the mouth of Five Lakes Creek about 13 miles southwest of Lake Tahoe. The springs are little known and very inaccessible.

Wentworth Springs are near Gerle Creek, 5 miles directly west from Rubicon Springs. Two groups of carbonated springs issue along a wash in schistose rock. The springs are utilized by occasional campers.

QUICKSILVER.

Bernard Cinnabar Mine. See Bulletin 27, p. 190; U. S. G. S. Mon. XIII, p. 384. It is located two miles west of Nashville, on Fanny Creek, south of Big Sugar Loaf Mountain. The deposit of cinnabar occurs in the slates of the Calaveras formation. Idle. Bernard Cinnabar Mining Co., 127 Montgomery St., San Francisco, owner.

SLATE.

California Slate Quarry. It is 2 miles north of Placerville, located on the north and south banks of the American River. The character of the deposit is a blue-black slate containing pyrite. The pyrite appears to be confined to certain layers of slate. The quarries are located on both banks of the river. Idle. N. L. Kohn, of Placerville, owner.

California-Bangor Slate Quarry. Situated 1 mile northwest of Kelsey, on Dutch Creek. The property consists of 432 acres. It is on the same belt of roofing slates as that of the Eureka quarry. The character is a blue-black slate of good quality, with a high tensile strength. The strike of the cleavage is S. 25° E. The quarry has not been worked for a number of years. California-Bangor Slate Co., 406 First National Bank Bldg., Oakland, owner.

Chili Bar Slate Quarry. See our Bulletin 38. Situated 2 miles northwest of Placerville, in Sec. 36, T. 11 N., R. 10 E. Idle. J. G. Mothersole, of Placerville, owner.

Eureka Slate Quarry. This property is situated 1 mile south of Kelsey and 7 miles north of Placerville. Comprises 640 acres of patented mineral land. The property was operated steadily from

1903 to 1909, and a very fine quality of roofing slate produced. The slate is blue-black in color, in the most part free from impurities, with a high tensile strength. The strike of cleavage is S. 25° E. The quarry opening on the north side of the cañon is 90' high by 200' long. The quarry on the south side of the cañon has a face over 200' long and 70' high on one end and 200' high on the other end. This quarry has been sunk to a depth of 90' below the cañon. The waste product from these quarries ran about 85%. The capacity of quarry when under operation was 100 squares of roofing slate per day.



View of storage bins of Mountain Quarries, El Dorado County. Owned by the Pacific Portland Cement Company. Photo by C. A. Waring.

Equipment: 150 h.p. compressor, 5 hoisting engines, slate trimming machines, saw tables, rubbing bed and planers. The product was transported from quarry by an aerial tram across the American River to Placerville. This tram is 3 miles long, there being a distance of 13,000' between terminals, with 26,000' of drawing rope; was operated by 35 h.p. Pelton motor. Water was secured from the Truckee General Electric Co. ditch, by pipe line $1\frac{1}{2}$ miles long; with a head of 500'. Since the property was visited, operations have been resumed under the personal supervision of W. J. Dingee, 898 Monadnock Bldg., San Francisco, owner.*

*Since the above was written, it is stated that the Eureka Quarry has been sold (June, 1916) to the Sierra Slate Corporation, of New York. The new company expects to reopen the property on a large scale, and prepare for market from 1000 to 3000 squares per month. A "square" of slate is a sufficient number of pieces to cover 100 square feet of roof.



Eureka Slate Quarry, north of Placerville, El Dorado County.

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PLACER COUNTY.

By CLARENCE A. WARING, Field Assistant.

Field Work in October and November, 1915.

INTRODUCTION.

North of the "Mother Lode" region lies a district rich in mineral resources which needs only the stimulus of capital and stable, enterprising men to further develop its latent resources. Hydraulic mining, which occupied the early workers, is now "tied up" as it were, by federal antidebris legislation, which disheartened the operators and caused stagnation of the mining industry in general. Drift mining is



Photo No. 1. Model of a typical Hydraulic Mine of the Sierra Nevada Mountains. Installed by the State Mining Bureau in the Palace of Mines, Panama-Pacific International Exposition, San Francisco, 1915.

still being carried on and offers a few good opportunities. Quartz mining, with a few exceptions, is rather dormant and in need of capital to open up the prospects and old shafts, idle following a considerable period of depression.

Dredging is now one of the principal means of recovering gold in this region and holds considerable promise for the immediate future. The diversity of mining methods has made the work particularly interesting.

The writer has endeavored to obtain accurate information on prospects, as well as on operative mines, realizing that in the future our greatest resources lie in the many undeveloped and only partially prospected properties. It is to be regretted that time did not permit visits to many prospects which are no doubt worthy of note.

An attempt has been made to make this report a directory of all the mines in the counties covered, as well as reports on those which are active.

Acknowledgment is here made of the uniform courtesy and assistance of operators, employees and prospectors who made this report possible and made the work unusually pleasant.

Extending as it does, from the Sacramento Valley to the summit of the Sierras, Placer County offers a diversity of mining interests as well as a diversity of climate. In the middle fifties this county, with an estimated annual production of over \$6,000,000* in gold, produced nearly one-tenth of all the yellow metal taken from the entire state. In 1914, with a production of \$600,000 in gold, the county claims only about one-thirty-fifth of the total production. It is true that we had no dredgers in the early days, and these have maintained the high yearly state production. Considering, however, the fact that state production is only one-third what it was in the middle fifties, we see that the Placer County production has fallen off abnormally. The only reason seen for this slump in production is the marked inactivity of the drift and quartz mines which await only capital and enterprising, stable men to open them up and give a general feeling of confidence to the whole populace. The production table does not show a sudden decline in gold output; the decrease has been gradual but steady since 1894, and has fallen from \$1,850,000 to \$600,000, or to less than one-third in the last twenty years. Together with the decrease of gold production has been the shifting of population. Iowa Hill, which in 1859 claimed a voting population of 1249, now has only 69, and other mining towns have dwindled to small villages or disappeared entirely. Over 500 mining claims were recorded in 1887. Only 135 properties are now active, *i.e.*, being worked or having assessment work done. These are distributed as follows: 40 quartz, 44 drift, 15 placer, 3 dredge, 3 hydraulic, 1 asbestos, 2 chrome, 2 clay, 3 copper, 20 granite, and 2 magnesite. Of the 135 active properties, 64 were said to be producing in 1916 and are distributed as follows: 6 quartz, 18 drift, 12 placer, 2 hydraulic, 3 dredge, 2 chrome, 2 clay, 1 copper, 18 granite.

A revival of interest in mining is coming, in fact, many of the old properties are now being leased and work begun. This new activity will, no doubt, be more permanent than that of the old hydraulic days, and the mining industry will be on a firm foundation for years to come.

DESCRIPTION.

Name, derivation of.

Placer County derives its name from the Spanish word "placer," meaning a place where gold dust is found mixed with sand, earth or gravel.

*California Registers for 1856-7 and 1858-9.

Location and boundaries.

It was organized in 1851, and extends from Bear River and the north line of T. 17 N, southward to the American River and its middle fork. It is bounded by Yuba and Nevada counties on the north, by the state of Nevada on the east, by El Dorado and Sacramento counties on the south, and by Sutter County on the west.

Area.

The county embraces 1484 square miles, and has an average length of over ninety miles, and an average breadth of about 13 miles.

Population.

The census of 1910 placed the county thirty-first in rank with a population of 18,237. Auburn, the county seat, is a city of the sixth class, with a population of 2376 in 1915.

Valuation.

The assessed valuation of the county properties in 1915 was \$14,947,936.

Topography.

The topography varies from a low valley land of 100 feet or more above sea level, about Roseville and Lincoln, to rolling foothills in the neighborhood of 1000 feet about Newcastle and Auburn, and rugged mountainous slopes about Alta and eastward which reach an elevation of over 7800 feet at Summit.

Vegetation.

The vegetation and forestry vary with the elevation. In the low western region the valley oaks predominate, while in the foothills the live oak and digger pine are plentiful. In the higher territory laurel oaks, bull pine, sugar pine and cedars predominate. Deciduous fruits and grapes do particularly well as high up as Colfax.

Drainage.

The county is well drained by the Bear River to the northwest, and by the American River with its numerous forks to the south, east and central parts. The extreme east drains by way of Lake Tahoe into the Truckee River, which flows into the state of Nevada.

Power.

The river system of Placer County is particularly well placed to furnish water capable of producing an enormous amount of hydro-electric power, besides being afterwards available for irrigation purposes. In the days of hydraulicking many large flumes and ditches were constructed to carry water for monitors, besides smaller ones for running water wheels to operate stamp mills and arrastras. At present the principal flumes have been taken over by the Pacific Gas and Electric Company which, with a system of artificial lakes, furnishes

a constant water supply to its many power houses which transmit electricity to the many cities of the Sacramento-San Joaquin Valley and San Francisco Bay regions. The northern and western portions of Placer County are thus well supplied by branches of the main power lines, one of which follows the railroad from Alta to Sacramento with power houses at Drumm, Alta, Auburn and Newcastle; another line from Colgate power house in Yuba County runs southward to Sacramento, crossing the county through Van Trent and Lincoln.

The eastern part of the county is less fortunate, but private capital has installed a small plant in Volcano Cañon which supplies electricity for lighting at Forest Hill and for the mines in that vicinity. A branch line of the Pacific Gas and Electric Company connects at Alta and passes eastward through Damascus and Forks House to the Black Cañon Mine near Westville.

Transportation.

The county is perhaps more fortunate than many others, since the main line of the Southern Pacific Railroad crosses its western end and follows along the full length of its northern side. A branch of the Southern Pacific from Roseville through Loomis, Lincoln and Sheridan to Marysville furnishes excellent transportation for the extreme western portion of the county. The Nevada County Narrow Gauge Railway from Colfax to Nevada City furnishes transportation in Placer County for a small region southeast of the Bear River and north of Colfax. Automobile and wagon roads traverse the county and follow the principal valleys and ridges, making most of the mines fairly accessible.

GEOLOGY.

Placer County furnishes an excellent field for geologic work, and although geologic maps¹ have been published of the whole region, there are many problems in geologic history which are open to discussion and intensive work. It is to be regretted that more detailed work has not been carried northwestward beyond the "mapped" limits of the Mother Lode (Folio No. 63) to determine more surely the possibilities of certain veins carrying mineral of commercial value with depth. It does not seem reasonable that a lode so persistent should hold out such excellent opportunities as far north as 120° 30' and then disappear so suddenly or become barren, especially since the same granodiorite formation which underlies the Mariposa slates, diabase and amphibolite, is yielding such excellent returns in the region about Grass Valley. The fact is that veins do occur that have not been systematically mapped. Although the main "Mother Lode" is apparently shattered in the

¹U. S. Geol. Survey, Folios Nos. 18, 39, 66 and reprints of 3, 5 and 11.

region north of $120^{\circ} 30'$, the main lode formations continue northward from Enterprise, Amador County, through Placerville and Georgetown, El Dorado County; Colfax, Placer County; Grass Valley and Nevada City, Nevada County, and northwestward towards Challenge, Yuba County. The special report² on the Grass Valley and Nevada City region is the only detailed area covered by the work done north of the area covered by the Mother Lode Folio, excepting that on the Ophir District³ which can not, strictly speaking, be considered on the main lode. During the twenty odd years since the publication of these reports, the industry seems to have been left to take care of itself, and no detailed maps of the interlying vein systems have been made. To be of greatest economic value, geological reports should precede and point out opportunities rather than follow up development work which often depends on some accidental find which creates popular interest. Detailed reports on new territory should create an interest and lead to development work, should conditions warrant.

The reader is referred to the aforementioned Geologic Folios and Annual Reports for the geology of the county.

MINERAL PRODUCTION.

The mining industry in Placer County is confined at present to the production of gold, silver, copper, lead, clay and stone. The greatest value is obtained from the gold production. The silver and lead are derived from the refining of the gold and copper. The copper production for 1915 showed a decided increase over that for 1914 because of renewed activity by leasers.

Granite is quarried extensively in the region about Rocklin and furnishes building stone, monumental stone, and paving blocks. Clay is produced principally near Lincoln.

²Seventeenth Annual Report of U. S. Geol. Survey, 1895-6, Pt. II, pp. 13-263.

³Fourteenth Annual Report of U. S. Geol. Survey, 1892-93, Pt. II, 249-285.

PLACER COUNTY—Table of Mineral Production.

The following table shows the production of gold and silver since 1880, and the other minerals since 1894, as compiled from Mint reports and reports of the State Mining Bureau since 1894.

Year	Gold, value	Silver, value	Copper		Brick		Clay (pottery)		Lime and Limestone		Stone, including value	Miscellaneous and unapportioned		
			Pounds	value	M	Value	Tons	Value	Amount	Value		Mineral	Amount	Value
1880	\$828,123	\$640												
1881	850,000	6,500												
1882	800,000													
1883	810,000													
1884	887,320	5												
1885	906,301													
1886	1,071,663	1,387												
1887	855,510	566												
1888	850,000	1,000												
1889	1,245,491	1,975												
1890	1,003,602	1,045												
1891	908,495	5,921												
1892	1,150,080	2,120												
1893	1,351,250	616												
1894	1,851,215	664				\$27,740	22,000				\$67,200			
1895	1,699,635	5,273					15,000	15,000			56,020	Asbestos	25 tons	\$1,000
1896	1,674,844	6,690					10,000	10,000			44,216			
1897	1,524,941	6,784					7,500	7,500			39,412			
1898	1,488,022	5,670					12,300	12,300			29,833			
1899	1,100,081	1,206					15,000	15,000			61,595			
1900	986,155	12,038					15,000	15,000			115,069			
1901	900,745	4,823	11,200	\$1,764			15,000	15,000			102,847			
1902	843,366	3,341	3,200	368			15,000	15,000			156,402			
1903	570,571	1,116	4,000	520			15,000	15,000	\$1,500	\$9,000	198,530	Platinum		280
									24,000	4,000		Quartz		1,968
												Platinum		375
1904	778,355	9,330	600,000	76,500			16,100	16,100	\$15,333	8,737	123,448	Platinum	2 ozs.	36
1905	597,768	8,941	367,250	57,291			20,000	10,000			116,746	Platinum	66 oz.	12
1906			200,000	38,000			20,000	15,000			71,130	Asbestos	50 tons	2,500
1907							20,000	29,000			118,722	Asbestos	70 tons	3,500
1908					13,000	\$46,300	13,000	11,500			178,463	Asbestos	30 tons	5,000

1909	281,372	1,492		2,063	52,300	45,300	35,250	124,322	25,864	203,783	Unapportioned	1900-1909	592,362
1910	257,191	1,157		600	23,438	44,000	27,000	110,000	12,100	242,773	Asbestos	60 tons	6,000
1911	251,298	2,585	118,624	700	18,000	43,120	29,200			218,951	Asbestos	200 tons	20,000
1912	367,383	4,791	78,170	12,898	21,250	56,000	41,300	222,595	200,000	231,415	Magnesite	125 tons	500
1913	220,785	2,972	429	67	40,000	63,000	47,200			205,749	Mineral paint	300 tons	3,300
1914	600,000	4,500		60	40,000	63,700	49,000	202,575	202,575	203,583	Magnesite	90 tons	584
1915	414,319	24,543	*	*	40,000	40,126	37,536	21,236	2,432	98,187	Glass sand	50 tons	500
											Lead	1,000 tons	2,000
											Quartz	806 lbs.	35
											Lead	2,000 tons	4,000
											Lead	385 lbs.	15
											Unapportioned	711 lbs.	33
											(copper, et al.)		
Totals	\$30,775,784	\$134,308	1,383,326	\$202,896	\$281,288	595,446	\$486,065	569,566	\$2,885,220	\$2,885,220			\$1,280,810

*Included in unapportioned.

†Barrels of lime.

‡Tons of limestone.

MINING DISTRICTS.

Since few well defined mining districts exist in Placer County the following twenty-two districts have been selected from names in common usage throughout the region, together with those used on the books of the County Recorder of Placer County. Additions and changes have been made to a recent list[†] compiled from geographical names. The properties in *italics* are producing.

The **Blue Cañon** (Emigrant Gap) district includes all quartz, drift, and placer mines in the region about Blue Cañon. Slate and andesite are the prevailing formations. Active properties: Red Rock Quartz, Von Avery Quartz, Wild Yankee Drift and *Lost Camp Hydraulic*.

The **Butcher Ranch** district includes all quartz and placer mines in the region extending from Sheridan's and Oregon Bar, to and including Mammoth Bar on the middle fork of the American River. Diabase and slate are the prevailing rocks of the district. Active properties: Christmas Hill Quartz, Dewey Quartz, *El Dorado** and *Placer Dredge*, and *Pacific Dredge*.

The **Canada Hill** district includes all quartz, drift, and placer mines in the region about Canada Hill, Sailor Cañon, Seerret Cañon, and Westville. It lies about 40 miles by wagon road about N. 78° E. of Colfax, which is the nearest railroad station on the Southern Pacific. Slate and andesite are the prevailing formations. Active properties: Black Cañon Quartz, Herman Quartz, Gold King Quartz, Golden Reward Quartz, La Trinidad Quartz, Prairie Flower Quartz, Canada Hill Drift, *Fulton Drift*, *Monumental Drift*, Reed Drift, and *Park and Brown Hydraulic*.

The **Cisco** district includes all quartz and placer mines in the region about Cisco. Slates, schists and granodiorite with andesite capping in places, are the formations represented. No operative properties.

The **Colfax** district (recorded as the Illinois district and includes the Capehorn district) includes all quartz mines and quarries in the vicinity of the town of Colfax, on the Southern Pacific Railroad, and placer mines on the Bear River and North Fork of the American River. Gabbro, diabase, serpentine, slate and amphibolite are the principal formations. Active properties: Big Oak Tree Quartz, Red Bird Quartz, *Collins Placer*, *Estey Placer*, *Gillett Placer*, *Thenis* and *Adams Placer* and *Zelma Bell Placer*.

The **Dairy Farm** (Van Trent) district includes the copper-gold mines in the region about eight miles east and northeast of Sheridan, which is on the Oregon branch of the Southern Pacific Railroad.

[†]Bulletin No. 507, U. S. Geol. Survey, 1912, pp. 6 and 93-96.

^{*}*Italicized* properties producing.

Amphibolite and diabase are the prevailing formations. Active properties: *Dairy Farm Copper*,* Valley View Copper, and Bobtail Gold-Copper.

The **Damascus** (includes Pioneer district) district includes all quartz mines in the cañon of the North Fork of the American River, north of Damascus, and all placer mines in the region of Damascus and Red Point. The district lies about 18 miles N. 75° E. of Colfax. The automobile route is by way of Forest Hill, since the Iowa Hill wagon road is very steep. Slate capped in places by andesite are the prevailing rocks. Active properties: *Pioneer Quartz*, North Star Quartz, Eureka Drift, *Jarvis or Bob Lewis Drift*, Outhouse Consolidated or Sellier Drift, *Potato Flatiron Placer*, *West Chrome*.

The **Deadwood** district includes all the quartz, drift and placer mines on Deadwood ridge and in Indian Creek and the North Fork of the Middle Fork of the American River. The district lies east of Colfax and is reached by auto road, in dry season, by way of Westville, a total distance from Colfax of about 45 miles. A pack trail from Michigan Bluff cuts the distance from Colfax to 30 miles. Slate with andesite capping are the prevailing formations. Active properties: Rip Van Winkle, or Page and Buckman Quartz, and *Devil's Basin Consolidated Drift*.

The **Dutch Flat** (Gold Run, Towle) district, includes the drift and placer gold mines, the chrome mines and the asbestos mines in the region of the towns of Dutch Flat, Gold Run, Shady Run and Towle, all on the Southern Pacific Railroad. Gabbro, serpentine, slate and amphibolite, capped by andesite, are the predominating formations. Active properties: Rawhide Quartz, Federal Drift, *Dyer Drift*, Dutch Flat Drift, Haub Drift, Indiana Hill Drift, Moody Ridge Drift, *Stewart Drift*, Towle Magnesite, Morgan Asbestos.

The **Forest Hill** district includes all quartz, drift and placer gold mines on the Forest Hill divide, including those about the region of Bath, Baker Divide, Mayflower, Yankee Jim's, Spring Garden Camp, Todd's Valley and Paradise. The divide is reached by a 15-mile stage road from Colfax, or 30 miles from Auburn. Serpentine, slate and amphibolite, capped with andesite, are the prevailing formations. Active properties: *Dry Hill Quartz*, Eureka Consolidated Quartz, International Quartz, Mitchell Quartz, Dardanelles Drift, *Excelsior Drift*, Florida Drift, *Grey Eagle Drift*, Maus Drift, *Mayflower Drift*, Paragon Drift.

The **Gold Hill** district includes all quartz and placer mines and dredging ground in the region of Gold Hill and Virginia, 6 miles east of Lincoln. It includes the Belmont and Three Stars properties.

*Italicized mines producing.

Granodiorite is the country rock. Active property: *Gardella Gold Dredge*.*

The **Hotaling** district includes the iron and limestone deposits in the region about Hotaling, 5 miles by road northwest of Clipper Gap, the nearest railroad station. Diorite, granodiorite and slate are the formations represented. No active properties.

The **Iowa Hill** district includes all the quartz, drift and placer mines north to the North Fork of the American River and along Shirt-tail Cañon and Indian Creek in the region about what is known as the Iowa Hill Divide, including Succor Flat, Wisconsin Hill, Independence Hill, Strawberry Flat and Monona Flat camps. The district lies about eight miles by road east of Colfax. Slate and amphibolite with andesite capping are the prevailing rocks. Active properties: Blue Wing Quartz, *Carey Drift*, *Dewey Drift*, *Mohawk Drift*, Penn Valley Drift, Santa Fe Drift, Union Drift, Waterhouse or Big Dipper Drift, Welcome Drift, *Booth Placer*, *Kinder River Placer*, *Pine Avenue Placer*, *San Francisco Placer*, Placer Counties Magnesite, *Turner* and *Butler Chrome*.

Bibl.: Rep. X, 1890, p. 419.

The **Last Chance** district includes all quartz, drift and placer mines in the region about Last Chance, Bald Mountain (Duncan Peak), and Duncan Cañon, including the Blue Eyes property, and the French Meadows region. The district is reached by trail 14 miles from Michigan Bluff, or by wagon road about 50 miles from Forest Hill and Bald Mountain. Slates with andesite capping are the principal formations. Active properties: Hermit Quartz, *Dirie Queen Drift*, *Glenn Consolidated Drift*, *Hometicket Drift*, Jack Robison Drift, *Pacific Slab Drift*, *Placer Gravel* or *El Dorado Drift*, Red Star Drift, *Park* and *Brown Hydraulic*, and Pine Nut Hydraulic.

The **Lincoln** district includes the region about the city of Lincoln, where clay and building stone are quarried. Eocene sedimentary rocks and andesite prevail. Active properties: *Gladding-McBean Clay*, *Lincoln Clay*.

The **Michigan Bluff** district includes all quartz and placer mines in the region of Michigan Bluff, Baker's Ranch and American Bar mine, near the Middle Fork of the American River. Serpentine, amphibolite and slate, with andesite capping are the common rocks. Active properties: Bunker and Nihill Quartz, Champion Quartz, Daniel Webster Quartz, Franklin Drift, Golden Sheaf Drift, Gorman Drift, Marian Drift, Swift Shore Drift, Turkey Hill Consolidated Drift, *Bogus Thunder Placer*, *De Maria Placer*, Lehigh Placer, and Pleasant Bar Placer.

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The **New England Mills** (Weimar) district, includes all quartz mines in the region south of Powell Hill and about Weimar and Applegate. The mines lie chiefly east of the Southern Pacific Railroad. Placer deposits along the American River are also included. Slate and some intrusive serpentine are the principal formations. Active properties: Alameda Quartz, Annie Laurie Quartz, Big John Quartz, *Black Oak*,* Quartz, Ruby Quartz.

The **Ophir** (includes Auburn) district lies south and west of Auburn and north of Newcastle. It includes all quartz and placer mines about Ophir and Duncan Hill. Granodiorite and amphibolite are the common country rocks. Active properties: Crandall Quartz, Eureka Quartz, Hathaway Quartz, Hope Quartz, *Little Banner Quartz*, *Oro Fino* or *Bullion Quartz*, Spanish Quartz.

Bibl.: Rep. X, 1890, pp. 427-430; Annual Rep. XV, U. S. G. S., Pt. II, 1892-3, pp. 243-284.

The **Ralston Divide** district includes all drift and placer mines along the divide between Long Cañon on the south and the Middle Fork of the American River on the north. The district is very inaccessible and is reached only by a steep trail 15 miles from Michigan Bluff or by a circuitous road via French Meadows, about 50 miles from Soda Springs Station near the Summit. Slate and andesite are the principal formations. Active property: *Ralston Divide Drift*.

The **Rock Creek** district includes all quartz mines north of Auburn, in the region south of the Hotaling district. Serpentine, diabase and amphibolite are the principal formations represented. No active properties.

The **Rocklin** (Loomis) district includes all granite quarries and placer deposits in the region about Rocklin. Granodiorite and andesite are the formations. Active quarries: *Alexson*, *Anderson*, *Andrews*, *California*, *Delano*, *Escola*, *Griffiths*, *Hebrick*, *Hendrickson*, *Huhtala*, *Leed*, *Oscar Kesti*, *Kesti*, *Liikola*, *Maki*, *Pacific*, *Pisila* and *Aho*, *Union* and *Wickman*.

The **Tahoe** district includes all the eastern part of the county adjacent to Lake Tahoe. It includes all gold and molybdenite prospects and mineral springs scattered throughout a large area of varied formations, chief among which are granodiorite and slate overlain by andesite and basalt. Active properties: *Chicago Quartz*, *Joe Dandy Quartz*, *Lost Emigrant Quartz*.

**Italicized* mines producing.

MINERALS AND MINES.

ASBESTOS.

The principal asbestos minerals are amphibole and serpentine. Tremolite and actinolite, two varieties of amphibole, are often found in such form that the fibres are fine, flexible, easily separated by the fingers and look like flax. These varieties are called "asbestos," "hornblende asbestos," or "amphibole asbestos," and are closely allied with the pyroxene and hornblende rocks. Chrysotile is a silky fibrous variety of serpentine which is superior in quality to amphibole asbestos. Chrysotile-asbestos so far as known occurs principally as "vein" or cross fibre, but also as "slip" fibre along fracture planes. Amphibole or hornblende asbestos is not known to occur other than as "slip" fibre. Chrysotile has been quarried in Canada to a depth of over 200 feet, and it is known to extend to a depth of over 400 feet. The deposits occur irregularly as a rule, and quarrying of large low-grade deposits is necessary to make such adventures paying or to properly develop the deposits. Exploration work by shafts is entirely misleading in determining the quantity in deposits of chrysotile. The deposits as a rule yield about 0.25 to 0.75 of one per cent chrysotile from the total rock quarried. The veinlets of chrysotile average $\frac{1}{4}$ " to $\frac{1}{2}$ " in width. The Canadian serpentine in which chrysotile occurs is of Cambrian age, while that in California is mostly Post-Jurassic or younger, geologically speaking.

As to acid-resisting qualities, amphibole asbestos is often preferable to chrysotile, since in order to resist acids the fiber should contain bases and silica in the proportion as 1:1. Chrysotile contains bases in the proportion as 3:2, and is attacked by very weak acids which dissolve the bases and leave almost pure silica without apparently destroying the fibrous condition. Boiling in dilute hydrochloric acid effects the same result. Chrysotile, however, withstands a temperature of 2000° to 3000° F. with no visible effect, although it becomes rather brittle upon losing a portion of its water of crystallization at high temperatures. Flame tests made by the writer on Canadian asbestos show that the tips of the fibers fuse and the fiber becomes very brittle in an ordinary Bunsen burner almost as easily as with specimens from California.

Bibl.: Mineral Resources of the U. S. 1914, Pt. 2, p. 98. Mines Branch Bull. No. 69, Canada Department of Mines, 1910.

Large deposits of chrysotile occur in Shasta and Trinity counties and it is reasonable to expect economic deposits in and around the serpentine areas of Placer County. Although the California chrysotile is not so fine a product as the Canadian, it could be used for most building purposes.

The **Morgan Asbestos Co.** has opened up several small slip-fibre veins of amphibole (tremolite) asbestos, near a serpentine area south of Towle. The mineral has good acid resisting qualities but fuses rather easily. The fiber is long and of a lustrous gray-green color, silky and almost as fine as that of Canadian asbestos. It spins readily into very tough, flexible threads. Assessment work only was being carried on by the principal owner, Thomas E. Morgan, in the fall of 1915, but it is reported that an eastern asbestos firm has taken an option on the property and intends to open it up. The company office is at 1516 Franklin Street, Oakland.

The commercial application of tremolite is rather limited, but it could be used satisfactorily in the manufacture of fibrous wall powder and of mineral wool.

D. J. Sullivan, of Towle, and **H. L. Kent** and **J. H. Johnson**, of Auburn, are reported to have located deposits of asbestos and limestone near Towle, while **John McInnis**, of Forest Hill, is reported to have an asbestos prospect north of Butcher Ranch.

The **Placer County Properties Co.**, formerly the Sprague-Keasby Asbestos and Magnesite Co., have four claims along a ledge of white slip fiber tremolite asbestos, about $\frac{1}{4}$ mile east of Iowa Hill. The names of the claims from north to south are as follows: Blue Wing, Washington Consolidated, Dewey Consolidated and Clear Fiber.



Photo No. 2. View northeastward towards Iowa Hill, showing old hydraulic gravel banks. The X marks the outcrop of asbestos on the Blue Wing claim and approximately the location of the old Blue Wing or Ostrom quartz mine.

On the Blue Wing claims, in the SW. $\frac{1}{4}$ of NE. $\frac{1}{4}$ of Sec. 28, T. 15 N., R. 10 E., the asbestos ledge has been exposed in the bedrock of the old hydraulic workings and on the slope of the south side of the North Fork of the American River Cañon. It lies at the contact of serpentine to the west and Cape Horn slates to the east, is about 15 feet wide and exposed

for 100 feet. Specimens of the mineral from the northern exposure are a white, flax-like fiber about eight inches long, which does not fuse readily, is flexible and fairly strong. The same ledge is exposed in a small ravine on the Washington Consolidated claim. Where exposed to the surface waters, the asbestos is entirely changed to silica, but retains the fibrous structure to some extent, resembling silicified wood. The ledge is similarly exposed on the north side of the Dewey Consolidated claim, but is probably not over 6 feet wide. The same ledge is said to be exposed on the Clear Fiber claim to the south, and is said to be cut through by the old drift tunnel of the Morning Star mine in Indian Cañon.

The nearest shipping point is at Colfax, 8 miles by steep mountain roads. No development work to speak of has been done. A 20-foot tunnel run into the ledge on the Washington Consolidated claim is caved. A shaft on the Blue Wing claim would probably be the more successful means of development.

The four claims include about 164 acres. S. M. Sprague, manager, Auburn; Mrs. Gertrude Shelley, secretary, 326 Ochsner Building, Sacramento, Cal.

BRICK AND CLAY.

Sand and clay suitable for brick, terra cotta, tile, etc., underlie a considerable territory in the region about Lincoln. The greatest initial expense is that of opening up the pits so that the clay may be quarried conveniently and cheaply. The best clay beds lie at depths of from 10' to 50' below the surface and are of upper Eocene, or Ione age.

Gladding, McBean and Co., have a large plant at Lincoln, where they make a specialty of architectural tile and brick, vitrified sewer pipe, tile, etc. The plant is at an elevation of 170 feet and occupies about 25 acres, while the company holds about 400 acres of clay lands in Secs. 4, 9 and 10, of T. 12 N., R. 6 E., M. D. M. Water is obtained from the Lincoln gravity system from the South Yuba Ditch of the Pacific Gas and Electric Co. The company was organized in 1875, incorporated in 1886 and has operated continuously for forty years.

The clay beds in the different pits vary considerably in both quality and thickness. A section in the north pit shows soil 2', volcanic breccia 10', fireclay 10', pipe clay 6' and fine, white terra cotta clay 20'. The south pit is being worked by teams and hand labor and shows soil 1', volcanic breccia 12', light sandy clay 8', fine sand 4', sandy yellow clay 7', sandy clay and gravel 6' and clay below. Photo 6 shows how the material is worked in benches and loaded directly onto the cars which transport it to bins adjoining the manufacturing plant. The steam shovel is shown at work stripping off the volcanic breccia, which is broken



Photo No. 3. Hobart Building, San Francisco, faced with architectural terra cotta, manufactured by Gladding, McBean & Co. plant at Lincoln, Placer County.
Photo by Walter W. Bradley.

up by blasting and dumped as waste from a spur track to the north. At the pit illustrated, the sequence of rock strata is as follows: andesite capping 10', fine sand 16', gravelly clay 15', pottery clay 20' or more, underlain by a bed of lignite. The occurrence of small rolling knolls on the valley plain, indicating a doming of the sedimentary strata, brings the clay beds nearer the surface and permits of better drainage for the pits which can be worked only during the dry season.

The clay is handpicked at the pit and transported to the plant, where it is ground and tempered, then pressed by machinery and moulded by hand. The raw forms are then dried in heated rooms and later burned in kilns. Seventeen kilns are used for sewer pipe and brick and fifteen for architectural terra cotta. Electricity, steam and air are used for power, and oil for fuel. About 200 men are employed, including architects, foremen, pressers and common labor. Quarrying of the clay costs from 5 to 6 cents per ton, stripping off the andesite costs about 4 or 5



Photo No. 4. Headquarters of Firemen's Fund Insurance Co., San Francisco, faced with architectural terra cotta manufactured by Gladding, McBean & Co. plant at Lincoln, Placer County. Photo by Walter W. Bradley.

cents per ton more. The clay, ground and delivered to the presses, costs about 65 cents per ton. About 600 tons per day are taken from the pits during the dry season.

Owned by Gladding, McBean and Company, 311-317 Crocker Building, San Francisco; president, P. McBean; vice-president, A. J. Gladding; secretary, Athol McBean.

Bibl.: Rep. X, 1890, p. 415 and Plate I. Bull. 38, 1906, pp. 219, 220.



Photo No. 5. Old northern pit of Gladding, McBean & Co., two miles north of Lincoln; showing andesite capping.



Photo No. 6. Main clay pit of Gladding, McBean & Co., one and one-half miles northwest of Lincoln, Placer County; showing method of working.

The **Lincoln Clay Products Company** property is located 2 miles northwest of Lincoln at an elevation of 130'. They hold 237 acres in the north half of Sec. 4, T. 12 N., R. 6 E., M. D. M. The deposits are similar to those nearer Lincoln, and the product is all shipped, no manufacturing being carried on. The clay is quarried by hand labor, loaded in dump cars, elevated by a 20 h.p. electric hoist to a platform, weighed and loaded directly into railroad cars for shipment. A $\frac{1}{8}$ mile spur

track connects with the main line of the Southern Pacific Railroad. The pit is 40' deep and 500' in diameter. Two gasoline locomotives are used for hauling the clay cars, and the company owns 2 miles of track. The company employs 25 men and it is said ships 25,000 tons of material which sells for about \$1.00 per ton. Drill holes for water are said to have gone through 112 feet of clay.

Owned by Lincoln Clay Products Company; M. J. Dillman, president, Lincoln; Ed. S. Brown, secretary, Sacramento.

Other deposits of clay have been reported⁵ in the region of Dutch Flat and Shady Run, and on Rich Flat south of Auburn. These still lie undeveloped on account of the limited demand for such materials.

CHROMITE OR CHROMIC IRON.

Several small detached deposits of chromite in or near areas of serpentine have been reported. One of these about $2\frac{1}{2}$ miles from Dutch Flat is said to have about 400 tons of ore in sight. Two small deposits are reported on the Forest Hill divide, one of which is being prospected by John McInnis, of Forest Hill. Specimens have also been seen from a deposit reported by S. P. Collins to be one mile from Auburn. A specimen from Mr. R. L. Dunn is reported to be from the SE. $\frac{1}{4}$ of Sec. 21, of T. 14 N., R. 9 E., M. D. M., near Weimar with about 100 tons of ore in sight.

Turner and Butler Mine. Iowa Hill district. Considerable ore was shipped from this property in the fall of 1916. The ore occurs as kidneys in serpentine and is said to run over 40 per cent chrome.

Owned by Messrs. Turner and Butler of Iowa Hill.

West Chrome Mine. Damascus district. Ore was shipped in the fall of 1916, from the property of Wm. West in the Green Valley region, 9 miles southeast of Towle. The property was leased by the California Manganese Company, who packed the ore on mules 6 miles and then hauled it to Towle station on the Southern Pacific Railroad. Three men were employed at the mine. It is said that about 100 tons of ore were available at the property and the cost delivered at the railroad was \$5.00 per ton.

COAL.

A bed of lignitic coal underlies the clay beds northeast of Lincoln in Sec. 9, T. 12 N., R. 6 E. The bed is of upper Eocene or Ione age and is from 5' to 12' thick. The quality of the coal is too poor to be marketable and all enterprises so far have been unprofitable.

Bibl.: Rep. VII, 1887, p. 151. U. S. G. S. Folios 3, 5 and 11, 1894.

Reprinted 1914, Sacramento, p. 4.

⁵Bull. No. 38, Cal. State Min. Bur., 1906, pp. 218-220.

COPPER.

The Sierra Nevada Mountain range includes a copper belt "which runs for about 500 miles through the eastern side of the state, with a width of from 50 to 75 miles. The deposits are mainly concentrated along a mineral belt which appears high in the range to the north, sweeps southeastward toward the central valley of the state, and then continues for about 300 miles southeasterly through the western foothills, to disappear in Kern County near the southern end of the range." From Nevada County southward this is known as the Foothill Copper Belt, and all the deposits in western Placer County are included in this belt.

The **Algol** prospect, in Sec. 9, T. 13 N., R. 7 E., M. D. M., about 9 miles northeast of Lincoln, has been abandoned. Mineralized lenses of ore varying from 20' to 10' in width were encountered. The development work consisted of two 120' shafts, with 200 feet of drifts. The ore is malachite, with some native copper and gold. Seven shallow shafts sunk at intervals, south of those on the Algol property, towards Coon Creek, and outcrops of copper bearing rocks on the Lardner and Keiler ranches, probably indicate the continuation of the same copper bearing formation.

The **Big Pine** prospect in Sec. 16, T. 12 N., R. 8 E., M. D. M., has a 170-foot shaft. Considerable chalcopyrite was encountered. Idle.

The **Dairy Farm Mine** located in the SW. $\frac{1}{4}$ of SE. $\frac{1}{4}$ of Sec. 27, T. 14 N., R. 6 E., M. D. M., eight miles northeast of Sheridan has been worked since 1913, under lease by the Van Trent Mining Company, Mr. M. A. Newman, manager, Van Trent, Placer County, California. It is owned by the Dairy Farm Mining Company, E. B. Braden, president, 812 Merchants Exchange Building, San Francisco.

The property includes 160 acres of patented land south of the Bear River from which water is obtained. Electric power is obtained from the Colgate branch of the Pacific Gas and Electric Co.

The mine was first worked for gold and silver, which occurred free with iron oxides. At about 85 feet in depth sulphides were encountered which averaged about 3% copper, with occasional values in gold. The mine has been worked principally for copper ever since, and the 100-ton capacity cyanide plant has fallen into disuse. The ore occurs as lens-shaped bodies in amphibolite schist. The main ore body varies from 10' to 60' in width and strikes N. 2° W., with a dip of about 60° E.

The present workings consist of a 3-compartment incline shaft to a depth of 590 feet, with about 1000 feet of drifts, cuts and raises on each level. Stoping is at present being carried on in the 200 and 300-foot levels, and about 500,000 tons of ore is blocked out. The shrinkage

⁶Bull. No. 50, 1908, p. 174.

system of mining is used, and about 150 tons of wall rock is taken out to every 350 tons of ore.

The mine is equipped with a 600-ton hoist, a 70-foot, 4-post head frame and a 1200 cubic foot Laidlaw-Gordon air compressor, with 12 Waugh and Water-Leyner drills. The ore is crushed with a 14" x 24" Buchanan crusher and raised by a 125' link line elevator. The ore is sorted on a 40-foot hand conveyor and the tailings carried away on a 200-foot waste conveyor.



Photo No. 7. Dairy Farm Mine, eight miles northeast of Sheridan, Placer County. The only producing copper mine in Placer County in 1915.

The ore is transported by a narrowgauge railroad to a point northwest of Sheridan, whence it is shipped by the Southern Pacific Railroad to Richmond. The ore is finally shipped by steamers to Oregon, where it is smelted. About 45 men are employed in the mine and 30 on top, including those on the railroad. About 350 tons of ore are taken out each day and the expense, delivered at the cars near Sheridan, is said to be less than \$1.70 per ton. Timber for the mine is shipped from San Francisco and costs from \$15.00 to \$18.00 per thousand feet laid down at the mine.

Other copper mines† and prospects which have not been operated in recent years are as follows:

The **Davenport** prospect, located in Sec. 15, T. 12 N., R. 8 E., is a prospect 1 mile south of Auburn. The ore consisted of chalcopyrite, malachite, with some iron oxides and pyrite in slate. The ore body strikes S. 3° E. and is about 2 feet wide. Development consists of a 70-foot incline shaft. Equipment consisted of a small hoist operated by a 10 h.p. steam engine. N. E. Davenport, Sacramento, owner.

†Bull., No. 50, 1908, pp. 205-211.

The **Elder** prospect, in Sec. 4, T. 13 N., R. 6 E., is $4\frac{1}{2}$ miles west of Clipper Gap, at an elevation of 1550 feet. The ore consisted of chalcopyrite, malachite and cuprite, with some pyrite and iron oxide. The wall rock is diorite and granodiorite. The ore body strikes N. 5° W., and dips 80° E. Development consists of a 25-foot vertical shaft. Idle.

Globe Consolidated. Ophir district. Sec. 8, T. 12 N., R. 8 E., M. D. M. Development work consists of a 250' incline shaft. The ore was malachite and chalcopyrite associated with pyrite. Three shifts of 5 men each were worked for a few months in 1916 by leasers who are said to have shipped 2 cars of ore to Kennett, Shasta County.

Owned by C. R. Tracy, Auburn, California.

The **Greenhorn** prospect is located on the west side of Greenhorn Creek, near its confluence with the Bear River. The prospect shows disseminated chalcopyrite near a serpentine-slate contact. The prospect is near the road from Colfax to You Bet.

The **Nevada Mining Company**, L. G. Schuster, of Auburn, manager, have prospected in Sec. 32, T. 14 N., R. 8 E., M. D. M. The ore consists of chalcopyrite and malachite, with some pyrite and iron oxide present. The ore body, at the contact of diorite and slate, strikes N. 50° W. and dips 30° E. Development consists of a 55-foot, two-compartment shaft.

The **Thomen** prospect is located 8 miles north of Auburn, in Secs. 4 and 5, T. 13 N., R. 8 E., M. D. M. The ore consisted of chalcopyrite and malachite with some pyrite and iron oxides present. The ore body, in schist, strikes N. 5° W. and dips 80° E. Owned by A. Thomen, of Auburn. Idle.

The **Valley View or Whiskey Diggings** mine is located in Sec. 24, T. 13 N., R. 6 E., M. D. M., 6 miles NW. of Lincoln, at an elevation of 400 feet. The property is owned by the Western Consolidated Gold and Copper Co. F. K. Lippitt, president, Petaluma; Mrs. Edith Lockwood, secretary, Bacon Block, Oakland. It includes 90 acres of patented land. The lode, as indicated by gossan on the surface, is reported to be 200 feet wide and 1000 feet long. The ore consists of chalcopyrite, cuprite and some native copper, associated with pyrite and iron oxides, and some zinc sulphide. It is low grade and much the same kind of ore as produced at the Dairy Farm mine. The ore body strikes N. 60° W. and dips 72° NE. in schist. Development work consists of a 170-foot shaft and 400 feet of adits. Equipment consists of a hoist and two 5-foot Huntington mills. The mine was worked at first for gold, which occurred free in the gossan near the surface. Sulphides were encountered

at depth. Sixteen men were employed in September, 1916. Reported sold to J. E. Landis and W. C. Gaylord, in March, 1916, for the Guggenheim interests.



Photo No. 8. Valley View Mine, or Whiskey Diggings, six miles northeast of Lincoln, Placer County.

GOLD, SILVER AND PLATINUM.

DISTRIBUTION.

Gold and silver in Placer County occur in quartz veins and in gravels. The quartz veins occur generally in three belts, in which they are irregularly scattered. The belt which lies in the main line of the "mother lode" follows the Mariposa slates, the continuity of which is broken north of Garden Valley, El Dorado County, where the Middle Fork of the American River cuts across it. These slates, however, reappear in considerable area north of the river, especially east of Weimar, and continue unbroken northward to Colfax. The same enriched belt in diabase, granodiorite and amphibolite, may be traced northwestward through Grass Valley, Nevada County, and Challenge, Yuba County.

East and west of the main belt are two offshoots of the main vein system which, so far as present development shows, are more productive than the "mother lode" in Placer County. The eastern branch diverges southeast of Georgetown, El Dorado County, and is traced by a belt of serpentine, gabbrodiorite and amphibolite, which pass under the Forest Hill and other divides and reappear along the line of the following localities: Drummond Mine; Succor Flat; just west of Hayden Hill; south of Towle; west of Washington, Nevada County; and through Alleghany, Sierra County.

The western branch begins to diverge southwest of Placerville, El Dorado County, and passes northwestward through Ophir, Placer County, and Albin Hill and Brown's Valley, Yuba County.

Considering this vein system as a whole, one is impressed with the variations of country rock in which the enrichment occurs. These range all the way from the very basic peridotites and serpentines, through the less basic diabases and more acid granodiorites. The concentrated occurrence of the yellow metal seems to be due more to some little known process of magmatic segregation rather than to influences of the country rock through which it is disseminated. The only influence that the country rocks seem to have had has been the later secondary enrichment or impoverishment of the original ore bodies.

The original source of the platinum has not been definitely ascertained, although it is thought to occur disseminated in the more basic rocks. It is found, thus far, only as placer along with the gold and silver.

The gold in the gravel deposits was originally washed from the quartz veins during the process of erosion. It became concentrated in the river channels by long periods of stream erosion and re-erosion as the mountains were being uplifted and reshaped during periods of crustal movement of the earth. When the Sierra Nevada Mountains were finally uplifted, these river beds were raised high and dry and were covered over in many places by volcanic flows of lava, mud and tuff, which have served to cap large deposits of the gravels and prevent their erosion. Modern streams have cut through these lavas and ancient river channels and have gone on concentrating the gold just as it was concentrated before the uplift. These ancient gravel channels have been worked successfully both by hydraulicking and by drifting, the latter method being used where the capping is hard and thick. The former method can now be carried on only when suitable restraining dams are built for storing the tailings to prevent injury to navigable streams or their adjacent lands.

QUARTZ MINES.

Adams Mine. Ophir district. Sec. 20, T. 12 N., R. 8 E., M. D. M. $2\frac{1}{2}$ miles southwest of Auburn. Elevation 1,050 feet. Fifteen-inch vein of quartz with galena and sulphurets in slate. Strike E.-W., dip 60°. 200-foot shaft. Idle. Owned by Calvin T. Adams, Newcastle.

Alameda Mine. New England Mills (Weimar) district. Sec. 25, T. 14 N., R. 9 E., M. D. M. Elevation 1400 feet. 120-foot dike in slate, carrying disseminated quartz, galena and iron. Strike N.-S. Dip 45° E. Open cut 600-feet and tunnel 275 feet. Assessment work

only. The Long Point mine adjoins it to the south. Owned by J. F. Wise and Martin Partridge, of Colfax.

American Bar Mine. Michigan Bluff district. Sec. 33, T. 14 N., R. 11 E., M. D. M. Elevation 1800 feet. Two miles SW. of Michigan Bluff. Quartz with galena and pyrite in slate. Strike N.-E., dip S.-E. Shaft forty feet and tunnel 1950 feet. Water ditch three miles from Stitchner's Gulch. Idle for past 15 years, except a little prospect work. Owned by J. A. Shields, Josephine Mine, El Dorado County.

Annie Laurie Mine. New England Mills (Weimar) district. Secs. 24 and 25, T. 14 N., R. 9 E., M. D. M. Elevation 2000'. One hundred-foot dike, carrying free gold and sulphurets in quartz stringers. Strike NW.-SE., dip 40° E. Tunnel 50 feet. Assessment work only. Alameda Mine adjoins to the south. Owned by R. H. Young and E. Vore, of Weimar.

Bazacoo Mine. Butcher Ranch district. Secs. 22 and 26, T. 13 N., R. 9 E., M. D. M. Elevation 1700 feet. Eighteen-inch vein of ribbon quartz in slate. Strike NW.-SE., dip NE. Shaft 40 feet. Tunnel 400 feet. Patented. Idle. Owned by Sheridan Bros., Butcher Ranch.

Beauty Mine. Canada Hill district. Sec. 9, T. 15 N., R. 13 E., M. D. M. Elevation 6200 feet. A 2-foot quartz vein in slate, carries free gold with some galena and pyrite. The vein can be traced for 130 feet on the surface. It strikes N. 45° E. and dips 70° W. A 180-foot tunnel crosscuts the vein and 50 feet of drifting on the vein has been done. Equipped with hand outfit, windlass and shed. Ore averages \$10.00 per ton. Claims called the Beauty and Big Beauty. Assessment work only. Owned by Henry Snyder, of Grass Valley, Cal.

Belle Union Mine. New England Mills (Weimar) district. Sec. 35, T. 14 N., R. 9 E., M. D. M. Two miles SE. of Weimar. Elevation 2000 feet. Eight feet of broken slate and quartz along a fracture in slate. Strike NE.-SW. Dip 80° SE. Tunnel 295 feet. Water power. Idle. Owned by D. Jones, Clipper Gap.

Belvoir Mine. Ophir district. Sec. 18, T. 12 N., R. 8 E., M. D. M. Elevation 1000 feet. Quartz vein carrying free gold and pyrite in granodiorite. Strike NE.-SW., dip 45° SE. Shaft 180 feet. Tunnel 800 feet. Steam power. Idle. Owned by J. Kaiser, Ophir.

Big Blue Mine. Dutch Flat (Gold Run) district. Sec. 3, T. 15 N., R. 10 E., M. D. M. Two miles NE. of Gold Run. Elevation 3050 feet. Five-foot quartz vein with galena and sulphurets. Strike N.-S., dip E. Shaft 170 feet. Idle. Owned by Moody and Garety, of Gold Run.

Big John Mine. New England Mills (Weimar) district. Sec. 25, T. 14 N., R. 9 E., M. D. M. Three miles east of Weimar. Elevation

2,200 feet. Claims Tiger, Buena Vista, Ruby and Blue Bell. Twenty-foot dike with amphibolite footwall and slate hangwall. Strike N.-S., dip 45° E. Development consists of 50-foot open cut and 75-foot tunnel, also 20-foot shaft and 90-foot incline. Take out enough gold each year to pay for assessment work. Owned by Ed. Bigley, E. B. Odell, M. L. Odell and E. H., J. A. and M. A. Hinchey, of Weimar.

Big Oak Tree Mine. Colfax district. SE. $\frac{1}{4}$ of Sec. 33, T. 15 N., R. 9 E., M. D. M. One mile west of Colfax. Elevation 2300 feet. Eighteen-inch vein of quartz, carrying free gold and pyrite, in diabase. Strike NE.-SW., dip 80° N. Incline shaft 180 feet. Drift of 40 feet on 120-foot level. This mine was closed about 1888 by an injunction obtained by the Rising Sun Mine, the owners of which claimed that the Big Oak Tree vein was a fork or spur of the Rising Sun patented vein, which lay between two of their north-south veins.

Three shifts of four men each were engaged in pumping out the Big Oak Tree mine during the months of September and October, 1915. An assay made for the writer of the mineralized quartz taken across the vein when the mine was pumped out ran \$0.80 in gold per ton. Installation of new machinery with electric power was contemplated. Owned by J. C. Valentine of San Francisco. Leased by a Colfax syndicate, of which D. A. Russell, D. Falconer, D. A. Gillen and J. Toman, of Colfax, are the board of directors.

Black Cañon Mine. Canada Hill district. Sees. 2, 3 and 10, T. 15 N., R. 12 E., M. D. M. Three miles east of Westville. Elevation 5,500 feet. Quartz ledge in slate and metamorphic-sandstone, carries free gold and pyrite. Development work consists of a 300-foot shaft and two tunnels: No. 2, 400 feet long, and No. 3, 200 feet long. Equipment of the mine consists of an Ingersoll Rand Imperial Compressor, capacity 650 feet of air per minute, which runs air drills, a piston machine and a jack hammer at 90 pounds pressure. The 37 h. p. electric hoist is good to a depth of 500 feet. The 20-stamp mill, run by two 25 h.p. motors, has 1050 pound stamps or a capacity of 50 tons of ore per day. A 10" x 12" jaw crusher is run by a 10 h. p. motor. Power is secured by a 13-mile line from the Pacific Gas and Electric Company, at Alta. A 100 h. p. transformer is installed near the mine. Water is pumped by a 5 h. p. motor from Black Cañon Creek for the compressors, the overflow running to the batteries. There is plenty of pine timber on the property, and a sawmill is operated by the mine. The ore in the chutes averages \$7.00 per ton, while the balance averages about \$1.00 per ton. Probably an average of all the ore milled would be \$3.00 per ton. Mining and milling costs about \$2.20 per ton. The property has a shop, 26-room bunkhouse, large dining-room, and office. Owned by E. C. Cavanaugh and Judge Aiken Estate, of San Francisco, and the Dickson

Estate, of Titusville, Pennsylvania. J. Cullen, San Francisco, secretary; E. B. Quigley, superintendent and manager, Westville.

Black Oak Mine. New England Mills (Weimar) district. Sec. 35, T. 14 N., R. 9 E., M. D. M. Three miles south of Weimar. Elevation 1875 feet. Three-foot quartz vein carrying 3% sulphurets in slate. Strike N. 10° E., dip 65° E. Tunnel 150 feet, run to cut ledge. Drift N. 400 feet and S. 600 feet. Old shaft sunk in north drift. Equipped with tracks and push car. The Northern Light property adjoins the Black Oak to the northeast. Four men have been cleaning out the old workings preparatory to opening them up. Owned by Drexler Estate of San Francisco $\frac{3}{8}$, Mr. Wyman, of Applegate, $\frac{1}{8}$, and J. A. Graves, of Weimar, $\frac{1}{8}$. Leased to John and Ed. Major and Frank Cannon, of Weimar, who have temporary quarters just south of the mine.

Black Spanish No. 2. Ophir district, Sec. 7, T. 12 N., R. 8 E., M. D. M. Quartz vein in granodiorite. Idle. Owned by J. E. Walsh, East Auburn.

Blue Bell Mine. Dutch Flat district. Sec. 3, T. 15 N., R. 11 E. Elevation 3000 feet. Two and one-half miles southeast of Shady Run. Four-foot free milling quartz vein in slate. Developed by tunnels. Patented. Idle. Owned by A. Percival Crittenden, of Towle.

Blue Wing or Ostrom Mine (formerly the Pritchard Gravel Mine). Iowa Hill district. Sec. 28, T. 15 N., R. 10 E., M. D. M. One and one-half miles NE. of Iowa Hill. Elevation 2800 feet. Twenty-foot quartz vein, with some free gold and sulphurets, between slate and serpentine. Strike N. 35° E. Dip 38°. Tunnel 150 feet. Shaft 30 feet. Claims, Blue Wing and Wolverine. The vein outcrops for about 500 feet, and is exposed both in the bedrock of the old hydraulic works and on the side hill which slopes steeply down to the American River. So-called assessment work is done yearly. An asbestos ledge claimed by the Placer County Properties Company is exposed about 100 feet west of the quartz vein. Water is available from the Gleason ditch, about $\frac{1}{4}$ mile east. Owned by W. A. Hilliard, of Grass Valley.

Bobtail Mine. Dairy Farm district. Sec. 18, T. 13 N., R. 7 E., M. D. M. Seven miles northeast of Lincoln. Elevation 500 feet. Three-foot quartz vein with diorite foot wall and slate hanging wall. Strike NW.-SE., dip NE. Shaft 60 feet. Drift 90 feet. Hand work, with windlass. Ore said to run about \$10.00 per ton. Owned by Wm. Recknagel, of Auburn, who thinks the ledge is very much like that at the Dairy Farm.

Bonanza Mine. Damascus district. Sec. 11, T. 15 N., R. 11 E., M. D. M. One mile northeast of Damascus. Elevation 3200 feet. Four-foot quartz vein carrying free gold. Slate wall rock. Shaft 60

feet and one tunnel. Idle. Owned by Jerry J. Sullivan, San Francisco.

Bibl.: Placer County Register of Mines, 1902. State Min. Bur.

Bonnie Bee Mine. Blue Cañon district. Sec. 3, T. 16 N., R. 11 E., M. D. M. Three miles northwest of Blue Cañon. Elevation 3,450 feet. Three quartz veins, 4 feet, 6 feet and 12 feet wide; carrying free gold and sulphurets, in slate. Strike NW.-SE., dip 90°. Shaft 30 feet. Tunnel 140 feet. Some drifting. Water power was used. Electricity available. Mill. Idle. Owned by J. L. Waggoner Estate, Dutch Flat, and Bonnie Bee Gold Mining and Development Company.

Boulder Mine. Ophir district. Sec. 18, T. 12 N., R. 8 E., M. D. M. Patented. One-half mile east of Ophir. Elevation 950 feet. Two-foot quartz vein in granodiorite. Strike N. 40° W., dip SW. 45°. Shaft 250 feet. Tunnel 300 feet. Water power was used. Electricity now available. Mill. Idle for several years. Owned by Jack Smith. Leased by E. Lavelle, of Ophir.

Buena Vista Mine. New England Mills (Weimar) district. Sec. 24, T. 14 N., R. 9 E., M. D. M. Adjoins the Red Bird mine to the south. Free gold and pyrite in a 6-foot to 25-foot ledge of decomposed quartz in slate. Strike N.-S. Tunnel 125 feet. Mill tests are said to have run \$6.00 in gold and \$4.00 in sulphides. Owned by Ed. Bigley, of Colfax.

Bunker and Nihill Mine. Michigan Bluff district. Sec. 32, T. 14 N., R. 11 E., M. D. M. Three miles southwest of Michigan Bluff. Quartz vein, carrying free gold in slate. Owned by H. H. Bunker and J. A. Nihill, of Michigan Bluff.

Burner Prospect. Forest Hill district. Sec. 14, T. 13 N., R. 9 E., M. D. M. Strike N. 12° W., dip 45° E. Shaft 29 feet. Tunnel 40 feet. Ore said to assay \$6.00 per ton. Owned by J. W. Burner, Forest Hill.

Butt's Mine. Ophir district. Sec. 21, T. 12 N., R. 8 E., M. D. M. A four-foot quartz vein, in granodiorite, carries free gold with some galena and sulphurets. Strike E.-W. Dip 45° S. Shaft 40 feet. Tunnel 800 feet. Five-stamp mill. Ore reported to have averaged \$8.00 per ton. Idle for over 15 years.

Calf Pasture Mine. Rock Creek district. Sec. 34, T. 13 N., R. 8 E., M. D. M. Three and one-half miles north of Auburn. Elevation 1000 feet. Eight-foot vein of quartz in amphibolite. Strike NW.-SE. Dip 90°. Incline shaft 250 feet. Drifting 40 feet. Claims, Calf Pasture, Calf Pasture Extension. Patented. Adjoins the Rock Creek Mine. Idle. Owned by W. E. Dean, Kohl Building, San Francisco.

California Quartz Mine. Ophir district. Sec. 16, T. 12 N., R. 8 E., M. D. M. Two and one-half miles southwest of Auburn. Eighteen-inch

quartz vein, carrying free gold in amphibolite. Strike approximately E.-W., dip 50° S. One hundred feet of open cut along vein. Patented. Idle. Owned by a Mr. Hubbell, of Auburn, in 1902.

Bibl.: Register of Mines and Minerals, 1902. Cal. State Min. Bur.

Cash in Dump. Tahoe district. Sixteen miles southeast of Soda Springs Station by wagon road. Elevation 5480'. Thirty-foot incline shaft on 18" vein of quartz striking N. 30° W. and dipping 32° SW. The vein is decomposed and porous near the surface and carries some iron sulphide. Three claims adjoin the Chicago Mine. Eight assays of the surface quartz are said to have averaged \$51.00 per ton. Owned by H. M. Black and H. J. Ellert of Virginia City.

Centennial Mine. Ophir district. Sec. 17, T. 12 N., R. 8 E., M. D. M. Elevation 1180 feet. One 18-inch quartz vein in amphibolite, carrying pockets of free gold and sulphurets. Strike N. 80° W. Dip 70° S. Tunnel 1100 feet. Owned by Walsh Bros., Freeman Hotel, Auburn.

Central Mine. Damascus district. Sec. 3, T. 15 N., R. 11 E., M. D. M. Three miles north of Damascus on the North Fork of the American River, north of Humbug Cañon. Elevation 2200 feet. Five-foot quartz vein, carrying sulphurets, in slate. Tunnel 300 feet. Water power. Mill. Idle. Owned by Lee Dorer, of Towle, and H. T. Power, of San Francisco.

Champion Mine, Michigan Bluff district. Sec. 15, T. 14 N., R. 11 E., M. D. M. One and one-half miles northeast of Michigan Bluff. Three-foot vein of quartz, carrying free gold, in slate. Shaft 120 feet. Assessment work only. Owned by Daniel Webster Mining Company, made up of F. A. Leach, A. Dibble and Mr. Hampton, of Michigan Bluff.

Cherokee Mine. Last Chance district. Three seams of ribbon quartz, in slate, carrying sulphurets. Strike NW.-SE., dip 70° E. Shaft 55 feet. Drifts 200 feet. Water from Deep Cañon. Idle.

Bibl.: Rep. XII, 1893-4, p. 206.

Chicago or Falls Creek. Tahoe district. Sixteen miles southeast of Soda Springs Station by wagon road, in Sec. 32, T. 16 N., R. 14 E., M. D. M. Elevation 5200'. Upper tunnel 52'. Lower tunnel 15'. Eighteen-inch quartz vein strikes N. 30° W. and dips 35° E. in limestone. The vein carries considerable pyrite, chalcopyrite and free gold. Oxidized ore is said to assay \$61.00 per ton while the sulphides assay \$17.00 per ton in gold, $\frac{1}{2}$ oz. silver and 8% copper. There is an excellent mill site 30' from the tunnel, on Wubbena Creek which carries from 10" to 12" of water during the dry season. Owned by Tom Young of Cisco. Leased by H. J. Ellert of Virginia City and F. L. Bradley, M. A. and S. B. Wright of Berkeley, who shipped some ore in October, 1916.

Christmas Hill Mine. Butcher Ranch district. Sec. 26, T. 13 N., R. 9 E., M. D. M. One mile southeast of Butcher Ranch. Elevation 1800 feet. A 300-foot porphyry dike in slate carries quartz stringers. Strike N.-S. Open cut 350 feet. Owner works in mine every year. Owned by J. A. Ware, of Butcher Ranch.

Conrad Mine. Ophir district. Sec. 17, T. 12 N., R. 8 E., M. D. M., $1\frac{1}{2}$ miles west of Auburn. Elevation 1150 feet. Thirty-inch quartz vein, carrying free gold, galena and sulphurets, in amphibolite. Strike approximately E.-W., dip 70° S. Shaft 130 feet. Tunnel 700 feet. Patented. Adjoins the Centennial, to which it is parallel. Owned by Wm. Walsh, Freeman Hotel, Auburn.

Crandall Mine. Ophir district. Sec. 8, T. 12 N., R. 8 E., M. D. M., $1\frac{1}{2}$ miles west of Auburn. Elevation 950 feet. A two-foot vein of quartz in amphibolite, carries sulphurets. Strike NE.-SW., dip 70° SE. Shaft 70 feet. Tunnel 400 feet. White-Rogers 5-stamp mill. Worked by hand drills. Water power. Owned by Wm. Jull, of Auburn.

Crater Hill Mine. Ophir district. Sec. 12, T. 12 N., R. 7 E., M. D. M., $3\frac{1}{2}$ miles west of Auburn. Elevation 1200 feet. Patented. A $2\frac{1}{2}$ -foot quartz vein, in amphibolite, carries galena and sulphurets. Strike N. 80° W., dip 48° S. Shaft 800 feet. Dump has been sorted and values taken out. Idle. The Kittler property is southeast of the Crater Hill, in the SW. corner of Sec. 7, T. 12 N., R. 8 E., M. D. M., 4 miles west of Auburn. A quartz ledge on the property, in granodiorite, carries galena and sulphurets. Strike E.-W., dip 45° S. Shaft 150 feet. Tunnel 400 feet. Idle. Owned by George A. Aldrich, of Auburn.

Bibl.: Rep. X, 1890, p. 433.

Dahlongega. Blue Cañon district. Sec. 12, T. 16 N., R. 11 E., M. D. M., 2 miles south of Emigrant Gap. Elevation 5350 feet. A $2\frac{1}{2}$ -foot quartz vein in slate carries sulphurets. Strike NE.-SW., dip SE. Tunnel 480 feet stoped to surface. In another tunnel run 100' lower the ore did not pay. Steam power. Mill burned. Worked, off and on, for 40 years. Owned by the Dahlongega Gold Mining Company. Mr. Tripp of Redlands, president; A. E. Rudell of San Bernardino, secretary.

Bibl.: Register of Mines and Minerals, 1902. Cal. State Min. Bur.

Daniel Webster. Michigan Bluff district. Secs. 15 and 16, T. 14 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles northwest of Michigan Bluff. Elevation 3600 feet. Claims, Daniel Webster and Champion. Placer patent. Two veins of free milling quartz, two feet and five feet thick, occur in slate. Strike NE.-SW., dip 80° E. Shaft 125 feet. Drifts 200 feet. Assessment work only. Owned by Daniel Webster Mining Company, made up of F. A. Leach, A. Dibble and Mr. Hampton, of Michigan Bluff.

Debb Mine. Dutch Flat (Shady Run) district. Sec. 4, T. 15 N., R. 11 E., M. D. M., 2 miles northwest of Shady Run. Elevation 3850 feet. Patented. A four-foot quartz vein, in slate, carrying galena and sulphurets, was discovered in the bed of the old hydraulic mine. Shaft 60 feet. Drift 60 feet. Idle. Owned by A. Percival Crittenden, of Towle.

De Maria or Garbe Mine. Michigan Bluff district. Located 5 miles southeast of Michigan Bluff. Includes 30 acres or more of unpatented land. Free crystallized gold occurs in quartz seams in a porphyry dike and is washed by the placer process. Owners, C. J. De Maria and Mr. Garbe, of Spring Garden.

Dewey Prospect. Butcher Ranch district. Sec. 22, T. 13 N., R. 9 E., M. D. M. Prospecting has been done on a quartz vein in slate west of the U. S. or Carlson ranch, by E. B. Gilbert, of Butcher Ranch.

Dewey and Stocker or Burt Mine. Forest Hill district. Sec. 30, T. 14 N., R. 11 E., M. D. M., two miles northeast of Forest Hill. Quartz vein in slate. Tunnel 1200 feet. Development work only. No ore milled. Idle. Owned by Mrs. S. Burt, of Forest Hill.

Don Prospect. Tahoe district. One-fourth mile east of the Lost Emigrant mine. Elevation 6700'. An 18" vein along a fracture in schist. Strike N. 80° E. and dip 70° S. Fifty-foot tunnel. Assessment work only. Owned by John Lass and Walter J. Wren of Virginia City.

Dorer Mine. Dutch Flat (Towle) district. Sec. 3, T. 15 N., R. 11 E., M. D. M., 2½ miles SE. of Shady Run. Elevation 4016 feet. Free milling quartz vein in slate. Strike N.-S., dip E. Tunnel 450 feet. Idle. L. R. Dorer, of Towle, owner.

Bibl.: Rep. VII, p. 468; Rep. VIII, p. 207.

Drummond Mine. Iowa Hill district. Sec. 1, T. 14 N., R. 10 E., M. D. M., 3 miles southeast of Iowa Hill. Elevation 3,600 feet. Patented. Two veins of quartz in slate. Strike N. 60° W., dip 80° NE. Shaft 50 feet. Tunnel 810 feet. Idle. Owned by Hon. C. F. Reed and Mr. J. E. Walsh, Freeman Hotel, Auburn.

Dry Hill Mine. Forest Hill district. Sees. 31 and 32, T. 14 N., R. 11 E., M. D. M., 2 miles southeast of Forest Hill. Three claims. Quartz stringers, carrying crystallized free gold, in slate. Drifts 1500 feet. Worked off and on for fifteen years. Owned by L. C. Lorenzo and C. J. De Maria, of Spring Garden.

Eclipse Mine. Ophir district. Sec. 17, T. 12 N., R. 8 E., M. D. M., 2½ miles west of Auburn. Elevation 1000 feet. Patented. A quartz vein in granodiorite carries galena and sulphurets. Strike N. 70° E., dip 45° S. Shaft 297 feet. Old mill used water power. Idle. Owned by Eclipse Milling Company of Auburn.

Bibl.: Rep. X, 1890, p. 433.

Eureka Consolidated. Forest Hill district. Sec. 1, T. 13 N., R. 9 E., and Sec. 31, T. 14 N., R. 10 E., M. D. M., one mile northwest of Spring Garden and 6 miles southwest of Forest Hill. Elevation 2000 feet approximately. Six claims. Quartz stringers scattered through 200 feet of amphibolite. Strike N. 11° W., dip 45° E. The ore is said to assay \$5.00 per ton. Owned by O. F., Wm. and G. Seavey, W. A. Shepherd, H. Adams, and G. Coffin, of Forest Hill.

Eureka Mine. Ophir district. Sec. 13, T. 12 N., R. 7 E., M. D. M., four miles west of Auburn. Elevation 900 feet. Claims, Eureka No. 1, Eureka Extension No. 1, Eureka No. 2, Eureka Extension No. 2. Includes about 69 acres. A two-foot quartz vein, in granodiorite, carries free gold, pyrite and galena. Strike N. 75° W., dip 68° S. Developed by a 280-foot shaft on Eureka No. 1, with 1000 feet of drifting on the 130-foot and 280-foot levels. Equipment of the mine consists of a 15 h. p. motor, which runs a compressor that furnishes air for six Waugh drills. Electricity is also used for the hoist, to a depth of about 1500 feet. Milling with two California Roller Quartz Mills, run by electricity, costs about \$2.00 per ton. Amalgamation tables are used, and the sulphides are sent to the Selby smelter. Two shifts of twenty men each are employed, and about thirty tons of ore per day are milled. The ore is said to average about \$10.00 per ton. Pine lumber from the divide costs about \$13.00 per thousand. Lagging and stulls cost about \$2.50 and \$6.50 per thousand, respectively, delivered at the mine. Electricity is secured from the Pacific Gas and Electric Company. Owned and operated by the Borealis Consolidated Mines Company; president, Dr. G. W. Hillegass, Oakland; manager, E. P. Stephenson, Freeman Hotel, East Auburn.

Fall Ravine. Last Chance district. Sec. 14, T. 15 N., R. 13 E., M. D. M., 10 miles northeast of Last Chance, on the south side of Bald Mountain, near Flat Ravine. Elevation 6000 feet. A three-foot quartz vein, in slate, carries galena and sulphurets. Strike N.-W., dip 60° E. Shaft 350 feet. Tunnel 598 feet. Drifting 60 feet. Idle. Owned by M. Savage, of Forest Hill.

Bibl.: Rep. XII, 1898-9, p. 208.

Gem Mine. Dutch Flat district. Sec. 2, T. 15 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles north of Red Point. Elevation 3200 feet. Patented. Quartz veins scattered through a 100-foot belt in slate. Strike NW.-SE., dip 70° NE. Shaft 70 feet. Tunnel 1200 feet. Idle for several years. Owned by John Rablin, of Dutch Flat.

Gold Blossom. Ophir district. Sec. 12, T. 12 N., R. 7 E., M. D. M., four miles west of Auburn. Elevation 700 feet. Patents, the Ohio, Gold Blossom, Back Action and Harrison or Gold Blossom No. 2. Three-foot vein of quartz in granodiorite, carrying free gold, galena

and pyrite. Strike E.-W., dip 85° S. Three compartment shaft 840 feet deep in center of property. Crosscuts every 100 feet to the ledge. Drifts 450 feet. Ten-stamp mill at shaft No. 1 and a 20-stamp mill at shaft No. 2. Electric power available. The ore is reported to average upward of \$7.50 per ton in free gold and \$0.75 in sulphurets. Considerable ore is blocked out. Idle. Owned by the Reed Estate, Auburn; J. H. Toler, manager; A. C. Lowell, executor.

Bibl.: Annual Rep. XIV, U. S. G. S., Pt. II, p. 270. Rep. X, Cal. State Min. Bur. 1890, p. 431.

Gold King Mine. Canada Hill district. Sec. 8, T. 15 N., R. 13 E., M. D. M., 10 miles east of Westville and 40 miles from Colfax, the nearest railroad station. Elevation 5860 feet. Twenty acres. A banded quartz ledge in schist carries free gold, pyrite, arsenopyrite and galena. The vein is from 12" to 20" thick on the hangwall, strikes N. 10° E. and dips 60° W. A 200' tunnel cuts the ledge at 120' and follows the vein for 80'. Ore milled ran about \$3.50 per ton. Assays said to run from \$8.00 to \$10.00 per ton. Owned by Jas. G. Dodds, Elizabeth T. Bell, and Nels Forthun, of Westville. Leased by Henry J. Snyder and John Henessy, of Grass Valley, who have taken up the Gold Queen and Gold Prince claims, north and south respectively of the Gold King.

Golden Reward. Canada Hill district. Sec. 5, T. 15 N., R. 13 E., M. D. M., 10 miles east of Westville. Elevation 6000 feet, approximately. Five claims, called the Golden Reward group. Twenty acres. A three-foot quartz vein, in slate, carries free gold and sulphides. The main N.-S. vein dips 45° and is cut by an E.-W. vein. Crosscut tunnel 800 feet. Ten-stamp mill. Assessment work only. Owned by Mrs. Wm. Bell and son, of Westville.

Golden Rule Mine. Rocklin district. Center of Sec. 17, T. 11 N., R. 8 E., M. D. M., two miles southwest of Rattlesnake Bar and eight miles east of Rocklin. Elevation 750 feet. A three-foot quartz vein, in granodiorite, carries free gold. Tunnel 1358 feet. Idle. Owned by Wm. Kendall, of Sacramento.

Golden Scepter or Ellen Dip. New England Mills district. Sec. 3, T. 13 N., R. 9 E., M. D. M., two miles east of Applegate in Codfish Cañon. Elevation 1625 feet. A thirty-foot mineralized belt between serpentine and slate carries values which were concentrated on the surface and hydraulicked in the early days. Strike N.-S., dip 90° . Shaft 16 feet. Tunnel 270 feet. Later prospecting has not uncovered a main vein. Assessment work only is now being carried on by the owners, Ed. Vore, of Applegate and E. Ephraim.

Golden Sheaf Mine. Michigan Bluff district. Sec. 27, T. 14 N., R. 11 E., M. D. M., one-half mile south of Michigan Bluff. Claims, No

Chunk (quartz), and Beehive (placer). Idle. Owned by the Golden Sheaf Mining Company; E. P. Thompson, of Michigan Bluff, manager.

Golden West Mine. Blue Cañon district. Sec. 25, T. 16 N., R. 11 E., M. D. M., three miles southeast of Blue Cañon. Elevation 3000 feet. Patented. A 200-foot ledge in slate, carrying quartz stringers. Shaft 100 feet. Tunnel 1500 feet. Drifting 500 feet. Idle. Owned by Reuben H. Lloyd, San Francisco.

Bibl.: Register of Mines and Minerals, 1902. Cal. State Min. Bur.

Great Western. Canada Hill district. Eighteen miles SE. of Cisco in Sec. 31, T. 15 N., R. 13 E., M. D. M. Elevation 5000'. Fourteen claims including 270 acres. A quartz ledge in diorite carries free gold and sulphides. A 430' tunnel run to crosscut the ledge did not strike it, since apparently the vein dips rather flat. Assays near the surface of the vein are said to have run from \$16.00 to \$20.00 per ton. Owned by the Great Western Mining Company. Mr. Kelley, president; Martin Winters, secretary, Pier 36, North River, New York.

Green Mine. Ophir district. Sec. 8, T. 12 N., R. 8 E., M. D. M., two miles northwest of Auburn. Patented. Eighteen-foot vein of quartz in slate. Values in pockets. Shaft 300 feet. Mill. Idle. Owned by Wm. Kendall, of Dutch Flat.

Bibl.: Rep. XII, 1893-4, p. 209.

Hathaway or Butts Mine. Ophir district. Sec. 18, T. 12 N., R. 8 E., M. D. M., three and one-half miles southwest of Auburn. Patented. Adjoins the Eureka mine on the east. Elevation 675 feet. A three-foot quartz vein in granodiorite carries argentiferous galena, auriferous pyrite and zinc blende. About 2% of the ore is sulphurets. The concentrated sulphurets are reported to have run as high as \$230 per ton. Strike of veins N. 75° W., dip 75° S. Shaft 756 feet. Tunnel 837 feet. Drifting 3,500 feet. Equipped with old 20-stamp (850 lbs. each) mill and 4 Woodberry concentrators. Electricity is now available for power. Bonded by Dr. G. W. Hillegass and associates of Oakland and E. P. Stephenson, of East Auburn. The same parties have bonded the Eureka, Kirkland and Kirkland Extension patents.

The Hathaway was taken over in 1916 by the Borealis Consolidated, the controlling interest of which is held by J. C. Winters of New York. The mine was being dewatered in October, 1916, and the shaft retimbered. The property will be worked in conjunction with the Eureka.

Bibl.: Rep. X, 1890, p. 429.

Herman Mine. Deadwood district. Sec. 29, T. 15 N., R. 12 E., M. D. M., 5 miles south of Westville. Elevation 4500 feet. Patented 1448 acres. Three veins of ribbon quartz varying from three feet to ten feet wide, in slate, carry free gold and silver, with pyrite and galena. Strike N. 10° E., dip 67° E. The veins can be followed for

1500 feet on the surface. Incline shaft 100 feet. Crosscut to ledge 1500 feet. Shaft 450 feet. Drifting on 100-foot level, N. 250 feet and S. 250 feet; on 200-foot level, N. 400 feet and S. 200 feet; on 300-foot level, N. 100 feet and S. 150 feet. No drifting on 450-foot level.

The mine was pumped out in July, 1915, and has produced on an average of 50 tons of ore per day since August 10, 1915. It is equipped with five air drills and two Water-Leyner drills. The ore is drawn from the mine in one-ton cars by mules. Two 200 h. p. steam boilers furnish power for an electric generator for lighting purposes, an air compressor and 1 Worthington and 1 Blake pump. Wood for fuel costs \$3.00 per cord.

The mill has thirty 1200-pound stamps, which have a six-inch drop, 100 times per minute. The ore is crushed to 24 mesh and the pulp passes over amalgamation plates. The tailings are not impounded.

From thirty to fifty men were employed in October 1915. When visited in September, 1916, poles to obtain electric power from the Black Cañon line were on the ground but the mine had been shut down and was rapidly filling with water. Good ore is reported in the lower workings. Owned by the Herman Property Syndicate. Operated by the Pennsylvania Gold Mining Co., 2001 First National Bank Bldg., Pittsburgh, Pa.; C. H. Stolzenbach, Pittsburgh, Pa., president; Samuel H. Brockunier, superintendent, Westville, Placer County, Cal.

Hermit Prospect. Last Chance district. Section 30, T. 15 N., R. 13 E., M. D. M., five miles northeast of Last Chance, in Deep Cañon. Elevation 5500 feet. Quartz ledge in slate, carrying sulphides. Shaft 10 feet. Drift 20 feet. Owned by John Lass, of Summit.

Hope Mine. Ophir district. Sec. 17, T. 12 N., R. 8 E., M. D. M., $1\frac{1}{2}$ miles southwest of Auburn. Elevation 1142 feet. Patented. Eighteen-foot quartz ledge, in slate, carrying sulphurets. Shaft 70 feet. Handwork, with windlass and pump. Owned by Andrew Johnson, of Ophir.

International Quartz Mine. Forest Hill district. Sec. 12, T. 13 N., R. 9 E., M. D. M., 7 miles southwest of Forest Hill. Free gold along the footwall of a 50-foot porphyry dike. Assays are said to run from \$3.75 to \$15.00 per ton. Owned by Patrick McInnis, of Butcher Ranch.

Joe Dandy. Tahoe district. One mile south of the Lost Emigrant mine. Elevation 6935'. Decomposed vein material, in decomposed limestone, strikes N. 70° E. and dips 70° SE. Opened up by a 34' shaft and 25' drift east along the vein material. The vein material pans. Claims, Joe Dandy and Billy Boy. Owned by John Lass, of Virginia City, and L. D. Heath, of Los Angeles.

Julia Mine. Damascus district. Sec. 3, T. 15 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles NE. of Damascus. Four-foot quartz vein in slate. Strike

NE., dip 80° E. Tunnel 80 feet. Idle. Owned by J. D. Sullivan and A. P. Crittenden, of Towle.

Julian Mine, formerly the Boulder Claim. Ophir district. Southeast corner of Sec. 7, T. 12 N., R. 8 E., M. D. M., three miles west of Auburn. Three-foot vein of ribbon quartz, carrying sulphurets, in granodiorite. Strike N. 10° E., dip 45° E. Tunnel 300 feet on vein. Shaft connects with tunnel at depth of 115 feet. Claim now covered by an orchard. Idle. Owned by Mrs. Dr. M. Schnabel, of Newcastle.

Bibl.: Rep. XII, 1893-4, p. 205.

LaFollette or Nob Hill Mine. Canada Hill district. Secs. 7 and 8, T. 15 N., R. 13 E., M. D. M., 8 miles east of Westville. Elevation 5,930 feet. Twelve-inch quartz ledge, in metamorphic sandstone, carries free gold, arsenopyrite, galena and sphalerite. Open cut 200 feet along vein. Ninety-foot tunnel. Twenty acres. Adjoins Gold King claim. Ore said to assay about \$10.00 per ton. Owned by Henry Snyder, of Grass Valley.

La Trinidad or Sterritt Mine. Canada Hill district. Sec. 34, T. 16 N., R. 13 E., M. D. M., eight miles south of Cisco. Elevation 6000 feet. On the North Fork of the American River, in Sailor Cañon. Patented. Four-foot quartz vein in slate, carrying free gold, strikes NW.-SE. and dips 45° NE. Tunnel 200 feet, caved; 500' drift with 700' raise used as ore chute. Ten-stamp mill. Last leased to the Viking Company who installed considerable machinery. Most of the oxidized ore is said to have been stoped. The ore is said to have assayed \$3.45 per ton. Owned by the New York Mining Company; Geo. F. Dennel, Cisco, superintendent; George Montgomery, of Mills College, manager.

Little Banner Mine. Ophir district. Sec. 22, T. 12 N., R. 8 E., M. D. M., 2 miles southeast of Auburn on the slope of the American River. Two claims. Three-foot to ten-foot quartz vein, in granodiorite, carries free gold and pyrite. Strike NE.-SW., dip SE. Tunnel 1,000 feet. Shaft 100 feet. Five hundred feet of drifts on the 100-foot level. The value of the ore ranges between \$6.00 and \$16.00 per ton. Equipment in 1915 consisted of a California Roller Quartz Mill. Owned by Charles Glover. Leased by Dr. G. W. Hillegass and associates, of Oakland; superintendent, E. Stephenson, East Auburn.

Live Oak Mine. New England Mills (Weimar) district. Sec. 23, T. 14 N., R. 9 E., M. D. M., two miles northeast of Weimar, in Live Oak Ravine. Free gold in a quartz vein in slate. Owned by Geisendorfer Estate. Bonded by Mr. Dan J. Williams, of Weimar, who is reported to have installed a Williams New Stamp and to have 4 men working. The ore is reported to assay \$15.00 per ton in the 175' shaft.

Lost Emigrant Mine. Tahoe district. Sec. 32, T. 16 N., R. 14 E., M. D. M., 12 miles by road southwest of Soda Springs station. Elevation 6700 feet. Twelve-inch to 4-foot quartz vein in diabase porphyrite, carries free gold and pyrite. Strike NW.-SE., dip 30° SW. Shaft 115 feet. Incline 500 feet. Drifting, 400 feet on 65-foot level, 50 feet on 300-foot level, 50 feet on 500-foot level. Old steam hoist and 4 1000-lb. stamps. Idle. Six hundred tons of tailings on the dump are said to assay \$10.00 per ton. Owned by F. L. Heath et al., Donner post office, Placer County, Cal.



Photo 9. Lost Emigrant Mine, eight miles southwest of Soda Springs, Placer County. Snow Mountain in the distance.

Lundquist Mine. Ophir district. Sec. 16, T. 12 N., R. 8 E., M. D. M., two miles southwest of Auburn. Reported to have had a 12-foot quartz vein, in slate, carrying free gold and sulphurets. Strike NE.-SW., dip 40° E. Shaft 120 feet. Tunnel 200 feet. Idle. Owned by Mrs. Lundquist, of Auburn.

Malmberg. Ophir district. Sec. 16, T. 12 N., R. 8 E., M. D. M., 1 mile southwest of Auburn. Patented. Quartz vein in amphibolite. Shaft 110 feet. Idle. Owned by Mr. J. Malmberg, of Auburn.

Marguerite. Rock Creek district. Sec. 3, T. 12 N., R. 8 E., M. D. M., 1½ miles north of Auburn. Elevation 1360 feet. Patented. Reported to be a 5-foot quartz vein in serpentine. Strike NW.-SE., dip 80° SW. Shaft 310 feet. Idle. Owned by San Francisco parties.

Mars Quartz Mine. Damascus district, 5 miles west of Westville, near the Pioneer mine. Patented. Eighty acres. Three quartz veins, in slate, carrying gold and silver. One vein is reported to be 20 feet wide. Tunnel 500 feet. Three-stamp mill. Ore is said to average \$3.50 per ton. Idle. Owned by Sam Wolford, Grass Valley, Cal.

Minna Ricca. Ophir district. Sec. 17, T. 12 N., R. 8 E., M. D. M., two miles west of Auburn. Elevation 1,000 feet. Reported to have been a 16-foot quartz vein, in slate, carrying free gold and sulphurets. Strike NE.-SW., dip 85° E. Shaft 150 feet. Tunnel 300 feet. Considerable good ore was taken from a chute. Idle. Owned by J. E. Walsh, East Auburn.

Bibl.: Rep. X, 1890, p. 433.

Mitchell Mine. Last Chance district. Located in El Dorado Cañon. Worked off and on since 1855. Owned by H. F. Adams, of Forest Hill, and Ben Taber (1/5), of Auburn.

Mollie Stark. Ophir district. Sec. 21, T. 12 N., R. 8 E., M. D. M., 1½ miles southwest of Auburn. Elevation 850 feet. Patented. Three veins of white quartz, in granodiorite, carry free gold and silver associated with galena and sulphurets. Strike NW.-SE., dip 74° SW. Shafts 40 feet and 18 feet. Incline 130 feet. Tunnel 200 feet. Drifting 270 feet. Idle. Owned by Mrs. Asa B. Eastwood, of Newcastle.

Moore Mine. Ophir district. Sec. 17, T. 12 N., R. 8 E., M. D. M., two miles southwest of Auburn. Elevation 1050 feet. Patented. Eight-foot quartz vein, in slate, carries free gold and sulphurets. Strike E.-W., dip 45° S. Shaft 300 feet. Idle. Owned by J. M. White, of Auburn.

North Star Mine. Damascus district. Reported to be in the neighborhood of the Pioneer mine. Seven-foot quartz ledge carrying free gold. Tunnels 80 feet and 90 feet. Owned by E. J. Power, E. J. Young and Henry F. Power, Berkeley.

Number Two Mine. Dutch Flat district. Sec. 10, T. 15 N., R. 10 E., M. D. M., one-half mile northeast of Gold Run. Elevation 2875 feet. Reported as a 12-foot quartz vein in slate. Strike N.-S., dip E. Open cut 80 feet. Shaft 40 feet. Idle. Owned by E. A. Moody and Mr. Garety, of Gold Run.

Old Pacific Mine. Ophir district. Sec. 25, T. 12 N., R. 7 E., M. D. M., one mile southwest of Newcastle. Reported as an 18-foot quartz vein, in granodiorite, carrying free gold, native silver and sulphurets. Strike E.-W., dip S. Shaft 200 feet. Idle. Owned by Mrs. Dr. M. Schnabel, of Newcastle.

Oro Fino Mine. Ophir district. Secs. 7 and 8, T. 12 N., R. 8 E., M. D. M., 4 miles west of Auburn. Elevation 1,002 feet. Claims: Bullion, Bullion No. 1, Bullion No. 2, Golden Eagle, Bellevue, Last Chance, Buckeye, California and Smith's Extension. Two-foot quartz vein in amphibolite. Strike E.-W., dip 65° S. Inclined two-compartment shaft 300 feet. Old Bellevue shaft 312 feet, with the following

drifts: 75-foot level, 370 feet drift; 117-foot level, 340 feet drift; 170-foot level, 200 feet drift; 224-foot level, 460 feet drift; 312-foot level, 730 feet drift. The 312-foot level connects with the Bullion No. 1 shaft, from which the ore is being worked and the water pumped. About one-half the ore between the Bellevue and Bullion No. 1 shafts has been stoped out. It is practically new ground between Bullion No. 1 and the old Bullion shaft, which is 100 feet deep with 100 feet of drift.



Photo No. 10.—Headframe and mill of the Oro Fino Mining Co., on Bullion No. 1, Ophir District.

Electric power is secured from the Pacific Gas and Electric Company. The equipment of the mine consists of a 350-foot air compressor, air drills, $1\frac{1}{2}$ -ton skips and telephone to the 300-foot level. A 75 h.p. electric motor runs the 10-stamp (1000-pound stamps) Joshua Hendy mill, two No. 5 Deister concentrators and 4-foot Joshua Hendy amalgamation barrel. About 28 men are employed.

About 30 tons of ore per day of 24 hours is milled. Mill tests are reported to have run from \$17.00 to \$18.00 per ton. About 70% of the gold is recovered on the amalgamation plates, while from 25% to 30% is recovered from the sulphurets. The ore taken as a whole averages about \$7.00 per ton. Work in September, 1916, was being carried on in the 400' level.

Owned by the Oro Fino Mining Company; H. Gridley, superintendent, East Auburn.

Pacific Slab Mine. Last Chance district. Sec. 33, T. 15 N., R. 12 E., M. D. M., 1 mile southwest of Last Chance. Quartz vein in slate, exposed in bedrock of drift mine. The ledge has not been worked.

Owned by the Pacific Slab Consolidated Mining Company, 1007 Monadnock Building, San Francisco; W. T. Davis, superintendent at drift mine.

Paragon. Forest Hill district. A quartz vein averaging 4 feet in width was encountered in the main tunnel of the Paragon drift mine about 300 feet from the portal at the contact of serpentine and amphibolite. The vein is exposed for over forty feet and strikes N. 65° E., dip 66° SW. The gravel is reported much richer near this vein. No developments. Owned by J. F. Thompson, of Bath.

Patrick Consolidated. Canada Hill district. Sec. 10, T. 15 N., R. 12 E., M. D. M., two miles southeast of Westville. Elevation 4800 feet. Three-foot quartz vein, carrying free gold, in slate. Strike NE.-SW., dip SE. Tunnel 550 feet. Idle. Owned by G. W. Snyder, of Damascus.

Pioneer Mine. Damascus district. Secs. 10 and 3, T. 15 N., R. 11 E., M. D. M., two miles northwest of Damascus. Elevation 3800 feet. Patented. Two quartz veins, one 14 feet wide carrying free gold and sulphurets. The wall rock is slate. Strike NE.-SW. Dip 80° E. Shaft 1200 feet. Tunnel 2300 feet. Drifts 2500 feet. Twenty-stamp mill. Employ thirty to forty men all year. Production between 50 and 60 tons per day. Owned by the Pioneer Gold Mines Company, 600 Thos. Clunie Building, San Francisco; C. M. Bandy, general manager; Fred Jost, superintendent at the mine.

Prairie Flower. Canada Hill district. Forty acres in Sec. 9, T. 15 N., R. 13 E., M. D. M., 8 miles east of Westville. Elevation 5,800 feet. Three-foot vein of ribbon quartz in slate carries free gold and pyrite. Strike N. 45° E., dip 70° W. Lower tunnel 1000 feet. Drift 500 feet, New 100-foot shaft. Stopped from lower tunnel to the surface for 400 feet along the vein. The last work consisted of a 50-foot winze and 60-foot shaft below the lower level. Water from Van Cliff Cañon furnishes power for five-1000 lb. stamps. Ore said to run between \$6.00 and \$10.00 per ton, and average \$8.00 per ton between the two levels. Owned by Mrs. Wm. Bell and son, of Westville.

Quien Sabe Mine. Canada Hill district. Sec. 9, T. 15 N., R. 13 E., M. D. M., 8 miles east of Westville. Elevation 5,300 feet. Forty acres. A 2-foot quartz vein, in metamorphic sandstone, carries free gold and pyrite, strikes N. 5° W., dips 75° W., and follows the bedding plane of the metamorphic rocks. A tunnel crosscuts the ledge at 60 feet and follows the vein for 40 feet. A lower tunnel 150 feet long has not reached the vein. A 160-foot pipe line from Van Cliff Cañon, a branch of Antoine Cañon, furnishes power for a Hendy triple discharge 2-stamp mill, for six months of the year. Other equipment consists of 36-inch Pelton waterwheel and a jaw crusher. The ore is said to mill from

\$3.00 to \$8.00 per ton. Concentrated sulphides are said to have run about \$380 per ton.

Owned by Peter Hinst and J. G. Dodds of Westville.

Rawhide Mine. Dutch Flat district. Sec. 4, T. 15 N., R. 11 E., M. D. M., three miles southeast of Towle. Two porphyry dikes 4 feet and 6 feet thick, in slate, carry free gold. Strike NW.-SE.; dip 45° NE. Open cut 20 feet. Shaft 70 feet. Tunnel 600 feet. Drifting 110 feet. Ten stamp mill. Water power. Fifteen men reported to be working in October, 1916. Idle in September, 1916. Owned by the Helester Gold Mining Co. Leased by Frank B. Keever. Frank Chase, Towle, foreman.

Razzle Dazzle. Ophir district. Sec. 20, T. 12 N., R. 8 E., M. D. M., 1½ miles east of Newcastle. Elevation 950 feet. Patented. Fourteen feet of decomposed quartz, carrying pyrite, in slate. Strike NW.-SE., dip 70° NE. Shaft 180 feet. Drift 60 feet. Idle. Owned by G. L. Threlkel, of Newcastle.

Reciprocity Mine. Gold Hill district. Sec. 11, T. 12 N., R. 7 E., M. D. M., three miles northwest of Ophir. Elevation 595 feet. A four-foot quartz vein, in granodiorite, carries gold and silver. Open cut 30 feet. Shaft 20 feet. Idle. Owned by I. Meyer, of Lincoln.

Red Bird Consolidated. New England Mills (Weimar) district. Sec. 24, T. 14 N., R. 9 E., M. D. M. Elevation 2000 feet. Auriferous quartz stringers in Mariposa slate. The mineralized ledge is about 25 feet wide and carries free gold and pyrite. Tunnel 200 feet. Double crosscut with 16-foot chamber. The Buena Vista mine adjoins the Red Bird No. 1 claim to the south, while the Red Bird No. 2 adjoins it to the north. The ore is said to average about \$10.00 per ton. Owned by G. A. Tubbs, Colfax.

Red Rock Mine. Blue Cañon district. Sec. 24, T. 16 N., R. 11 E., M. D. M., three miles southeast of Blue Cañon. Elevation 4200 feet. Patented. Ten-foot quartz vein in slate. Strike NW.-SE., dip W. Mill moved. Water power. Idle for several years. Owned by N. B. Willey, Blue Cañon.

Rip Van Winkle Mine. Formerly called the Lady Bedford or Page and Buckman Mine. Deadwood district. Sec. 29, T. 15 N., R. 12 E., M. D. M., six miles south of Westville. Four-foot to ten-foot vein of ribbon quartz in slate, carrying galena and pyrite. Strike NW.-SE., dip 50° E. Shaft 60 feet. Tunnel 1200 feet. One mile southeast of the Herman mine. Ore is said to average \$3.00 per ton. Old two-stamp mill dismantled in September, 1916. Assessment work only. Ore shoot said to have been lost by a fault. Owned by B. S. Buckman, of Michigan Bluff, and J. G. Dodds, of Westville.

Rising Sun Mine. Colfax district. Sec. 33, T. 15 N., R. 9 E., M. D. M., one mile northwest of Colfax. Elevation 2290 feet. Forty acres patented. One laminated quartz vein from 6 inches to 3 feet wide with several stringers, in diabase. The vein carries free gold, pyrite and chalcopyrite and strikes E.-W., with a dip 85° S.

Development consists of a shaft in the center sunk to the fourth level, with levels at 60', 111', 187', 268' and 350'; a second shaft (6 ft. x 12 ft.), with three compartments, to the east of the first has nine levels and is about 751 feet deep. The levels are 111', 187', 268', 350', 431', 511', 590', 668' and 751' below the surface. A third shaft to the west of the main shaft has two levels at 111' and 187'. The wall rock is hard and usually no timbering is required. A tunnel has been driven over 300 feet from a point .3 of a mile northwest of the property on the south slope of Bear River Cañon. It was the intention to work the mine more cheaply from the tunnel, but it has never been completed. The shafts are now caved at the surface.

It is reported that 80% of the auriferous value is free gold, while the balance is obtained from the concentrated sulphides which run from \$150 to \$200 per ton. Little work has been done below the fifth level and considerable low grade ore still remains above the fifth level. All improvements, including mill, hoist, etc., have been destroyed by fire. Assays made for the writer ran as follows:

No. 1. Quartz vein material from dump at Rising Sun Mine, \$1.10 per ton.

No. 2. Mineralized schist from same dump at Rising Sun Mine, \$0.40 per ton.

The power line of the Pacific Gas and Electric Company, from Alta, passes within one mile of the property.

Owned by Marie A. Valentine Estate, New York, and Werry Bros., Colfax.

Roosevelt. Tahoe district. Seventeen miles southeast of Soda Springs Station in Sec. 4, T. 15 N., R. 14 E., M. D. M. One claim adjoining the old Lost Emigrant mine. An oxidized vein is 3½' wide on the surface and 7' wide at the bottom of a 28' shaft. Quartz vein in diabase porphyrite. Owned by F. L. Heath et al., Donner, Cal.

Rublin Mine. Last Chance district. Sec. 34, T. 15 N., R. 12 E., M. D. M. On south side of the ridge towards Last Chance from the Pacific Slab mine. Shaft 150'. Tunnel 860' was run to tap the vein at 500' below the surface, but it is said that it was run too far south and never hit the vein. The tunnel was driven by machine drills supplied with air from a compressor run by water power. Idle. Owned by Messrs. Foley, McCarty and Casen of Chicago who bought it of D. M. Ray of Last Chance.

Ruby Mine. New England Mills (Weimar) district. Sec. 25, T. 14 N., R. 9 E., M. D. M., three miles east of Weimar near the American River. Elevation 2200 feet. Four-foot porphyry dike in slate, carrying free gold and sulphides. Strike N.-S., dip 45° E. Incline shaft 126 feet. Drift north 15 feet, south 14 feet. Ore said to assay \$1.00 to \$40.00 per ton. Assessment work only. Owned by E. H. Hinchey, Weimar, Cal.

Saint Lawrence Mine. Ophir district. Sec. 7, T. 12 N., R. 8 E., M. D. M., 3½ miles west of Auburn. Elevation 1000 feet. Patented. An 18-inch quartz vein in granodiorite carries free gold associated with pyrite and galena with some stibnite. Strike N. 70° W., dip 35° S. Shaft 300 feet. Tunnel 1000 feet. A 50 h. p. hoist and ten-stamp mill lie idle. Owned by the Reed Estate, of Auburn.

Bibl.: Rep. XIV, U. S. G. S., Pt. II, 1892, p. 271.

Salg Mine. Rock Creek district. Sec. 3, T. 12 N., R. 8 E., M. D. M., 1½ miles north of Auburn. Elevation 1300 feet. Patented. Quartz vein in slate, carrying free gold and silver in sulphurets and galena. Strike NW.-SE., dip 75° E. Shaft 200 feet. Idle. Owned by A. L. Smith, of Auburn.

Salsic Mine. Rock Creek district. Sec. 3, T. 12 N., R. 8 E., M. D. M., ¾ of a mile northwest of Auburn. One-foot quartz vein carrying free gold, pyrite and galena, in slate. Strike N. 45° W., dip 75° E. Idle. Owned by Smith and Fulweiler, of Auburn.

Bibl.: Rep. XII, p. 212, 1893-4.

Secret Town Mine. Gold Run district. Sec. 10, T. 15 N., R. 10 E., M. D. M., 1½ miles southeast of Gold Run. Elevation 2875 feet. Two-foot quartz vein in slate. Strike NW.-SE., dip 60° E. Shaft 75 feet. Tunnel 20 feet. Idle. Owned by E. A. Moody and J. E. Everhart.

Shady Run or Midas Mine. Dutch Flat district. Secs. 27 and 28, T. 16 N., R. 11 E., M. D. M., 1½ miles northeast of Shady Run. Elevation 2700 feet. Patented, 640 acres. Stringers of quartz, carrying arsenopyrite and 3% sulphurets in a 38-foot porphyry dike. Strike NW.-SE., dip 90°. Shaft 140 feet, tunnel 570 feet. Six drifts. Water-power mill. Idle. Owned by R. Watson, Midas.

Southern Cross Mine. Damascus district. Sec. 4, T. 15 N., R. 11 E., M. D. M., four miles northwest of Damascus. Patented. Three quartz veins, 2½', 4' and 5' wide in slate carry free gold, sulphurets and galena. Strike NW.-SE., dip 60° E. Tunnel No. 1, 700 feet; No. 2, 500 feet. Mill burned. Idle. Owned by E. L. Ford, of Towle, and A. W. Nicholls, of Berkeley. J. E. Hines, superintendent, Rock Springs, Wyoming.

Spanish Mine. Ophir district. Sec. 7, T. 12 N., R. 8 E., M. D. M., $2\frac{1}{2}$ miles northwest of Auburn. Elevation 1050 feet. Patented. Sixteen-foot vein of quartz, carrying free gold, in granodiorite. Strike NW.-SE., dip 45° NE. Shaft 200 feet. Bonded to Brown, DeCon and Company, of San Diego. Reported to be installing a hoist and compressor, and to have leased the mill on the Peachy Consolidated property. Owned by the Reed Estate, Auburn.

Texas Mine. Blue Cañon district. Sec. 20, T. 16 N., R. 12 E., M. D. M., four miles south of Emigrant Gap. Elevation 5600 feet. A three and one-half foot quartz vein, in slate, carries sulphurets. Strike N.-S., dip 60° E. Shaft 110 feet. Tunnel 400 feet, was never completed to bottom of shaft. Idle for 4 years. Owned by the Halsey Estate, of Towle. J. L. Gould, Alameda, president. Reported bonded to the Oakland Consolidated Gold Mining Company, Oakland, Cal.

Three Stars or Columbia Mine. Ophir district. Sec. 2, T. 12 N., R. 7 E., M. D. M., 7 miles west of Auburn. Elevation 850 feet. Patented. Claims: North Star, Middle Star and Morning Star. Two quartz veins, carrying free gold, silver and sulphurets, in granodiorite. Shafts 524 feet and 724 feet. Incline 541 feet. Drifts 3,176 feet. Water-power mill.

The Morning Star has a 90-foot shaft and 95-foot incline on a 12-inch vein of free milling quartz in granodiorite. Strike NE.-SW., dip 45° . Idle.

Owned by the Columbia Gold and Silver Mining Co., E. H. Vance, 1911 Webster St., Oakland.

Tiger Mine. New England Mills (Weimar) district. Sec. 25, T. 14 N., R. 9 E., M. D. M., three miles east of Weimar. Elevation 2200 feet. A three-foot quartz vein in slate carries free gold. Strike N.-S., dip 45° E. Open cut 50 feet. Shaft 30 feet. Incline 90 feet. Tunnel 50 feet. Adjoins the Red Bird No. 1 Mine. Idle. Owned by Ed. Bigley, J. W. Hinchey and Mr. Odel, of Weimar.

Tyler Mine. Near Clipper Gap. Thirteen-foot ledge of quartz, carrying sulphurets. Tunnel 190 feet. Owned by Levi Tyler, of Clipper Gap.

Van Avery Mine. Blue Cañon district. Sec. 14, T. 16 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles southeast of Blue Cañon. Elevation 4625 feet. Patented. Three quartz veins, one 6 feet wide, carrying free gold and sulphurets, in slate. Strike NW.-SE., dip 77° W. Tunnel 600 feet. Water power. Idle for 20 years. Buildings burned. Said to have never paid. Owned by L. Balliét, of San Francisco.

Washington Mine. Forest Hill district. Sec. 30, T. 14 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles east of Forest Hill. Elevation 3400 feet. Patented.

Two veins of ribbon quartz, 3 feet and 20 feet wide in diabase and serpentine. Strike N. 74° W., dip 80° . Tunnel 1400 feet. Water power. Mill removed. Idle for some time. Owned by A. M. Nihill, of Nevada and Jack Nihill, of Michigan Bluff.

Wubben Mine. Tahoe district. Sec. 32, T. 16 N., R. 14 E., M. D. M., 10 miles southeast of Soda Springs station on the Southern Pacific railroad. Elevation 6500 feet. Twenty-foot quartz vein, carrying free gold, in diabase. Strike north of west, dip south. Shaft 50 feet. Incline shaft 100 feet. Tunnel 50 feet. Idle. Prospect only. Owned by Herbrant, Eustice and Co., of Woodland.

GOLD—DRIFT MINES.

Allbright Mine. Rocklin district. Sec. 36, T. 12 N., R. 7 E., M. D. M., 2 miles east of Penryn. Surface hydraulicked. Bedrock tunnel reported to have been run 500 feet in slate and upraise made to the loose gravel, but little pay found. Idle.

Bibl.: Rep. XII, p. 204.

Alta Mine. Dutch Flat district. At Alta. Alta Gold Mining and Development Co., held $\frac{3}{4}$ mile along the cement "White" and "Blue" channels. A 2000-foot tunnel was started to top the gravels. Idle since Mr. J. E. Doolittle, of Dutch Flat, the superintendent, died.

American Hill. Canada Hill district. In Sec. 24 T. 15 N., R. 12 E., M. D. M. In Lost Cañon, 4 miles by trail southeast of Secret House. Gravels similar to those at Canada Hill occur. A large channel 250' wide and $\frac{1}{4}$ mile long and a small channel from 6' to 40' wide are said to occur. Work is said to have been mostly done along the south rim of the large channel.

Owned by Ben Denton of Westville.

Avalon Mine. Forest Hill district. Avalon Mining Company of San Francisco, ran a tunnel. Abandoned.

Azalea, or Blue Cañon Mine. Blue Cañon district. Sec. 22, T. 16 N., R. 11 E., M. D. M., 2 miles southwest of Blue Cañon. Elevation 4000 feet. Patented 360 acres. One and one-half miles on channel. Tunnel 3300 feet; did not strike a pay channel. Free wash gravel carried low values. Water-power. Prospect work only. Owned by the Azalea Gold Mining Company, J. B. Knapp, president, Blue Cañon.

Baker Divide Mine. Forest Hill district. Portions of Secs. 12, 13 and 18, T. 14 N., R. 10 E., M. D. M. On the Baker Divide, three miles northeast of Forest Hill. Elevation 2838 feet. Tunnel 3300 feet in cement gravel. Upraise 125 feet. Drifting 375+ feet. Idle. Owned by Mrs. Soule and Mr. Bacon, Bacon Block, Oakland.

Bibl.: Rep. VIII, p. 466.

Baker Ranch Prospect. Michigan Bluff district. Sec. 17, T. 14 N., R. 11 E., M. D. M., near the road from Forest Hill to Michigan Bluff. Elevation 3700 feet. Two short tunnels in a gravel channel. Gravel panned for values. Some work during rainy season. Owned by Mr. F. B. Ellsworth, of Baker Ranch.

Bald Mountain Mine. Last Chance district. Portions of Secs. 21, 22 and 28, T. 15 N., R. 13 E., M. D. M., in Flat Ravine, 10 miles southeast of Westville. Elevation 5800 feet. 160 acres. 10,000 feet is claimed along a north-south channel extending from Bald Mountain to Millers Defeat, 800' tunnel and 1000' drift along rim of channel. New 200' tunnel 300' lower in elevation than the 800' tunnel. 100' shaft with 150' drift and 600' along channel caved. Two 60' shafts caved. Channel said to be 200' wide where crosscut. Gravels said to have paid \$6.00 to \$7.00 per man in upper part of channel where drifted. Claim overlapped on the northwest by the Fall Ravine quartz mine. Idle. Owned by A. Harpending, 2607 Fruitvale Ave., Oakland, Cal. Fred W. Venzke, original locator, Westville, Cal.

Banner Mine. Dutch Flat district. Sec. 34, T. 16 N., R. 10 E., M. D. M. At Dutch Flat. Elevation 3100 feet. Patented. Cement gravel. Shaft 50 feet. Owned by E. C. Uren, Nevada City.

Bartley Consolidated Mine. Dutch Flat district. Sec. 26, T. 16 N., R. 10 E., M. D. M. Elevation 3600 feet. Patented 110 acres. Large deposit of low grade, free wash, blue gravel. Depth 200 feet. Channel 4000 feet. Tunnel 1400 feet. Idle. Owned by Wm. Rablin, of Dutch Flat.

Belle Verne Prospect. Last Chance district. Secs. 26 and 35, T. 15 N., R. 12 E., M. D. M. Across Grouse Cañon from the Hometicket mine. Elevation 4800 feet. Eighty acre claim. Channel said to run east-west on the south side of Grouse Cañon and may be 2000 feet long. Gravel is 2 feet deep and 30 feet wide and is capped with andesite. Tunnel 50 feet driven towards channel. Owned by George H. Smith, of Last Chance.

Ben Franklin Mine. Forest Hill district. One hundred and sixty acres on Swindle Hill near Yankee Jim's. Elevation 2350 feet. Near forks of Brushy Creek and Devil's Cañon. Bedrock tunnel 1200 feet. Upraise 50 feet. Idle. Owned by Joe Gilbert and R. C. Burry, of Forest Hill.

Bibl.: Rep. XII, 1893-4, p. 205.

Big Bar Prospect. Last Chance district. Sec. 20, T. 14 N., R. 13 E., M. D. M. Large bar in Duncan Cañon below the Blue Eyes property. Ground was tested for value and it was found to have been drifted by Chinese in the early days. Abandoned by Messrs. Threlkeld and Blohm, of San Francisco, and W. T. Davis, of Last Chance.

Big Gun. Forest Hill district. Idle. J. F. Thompson, Bath.

Bigelow. Forest Hill district. Idle. J. F. Thompson, Bath.

Black Hawk Mine. Forest Hill district. Secs. 13 and 14, T. 14 N., R. 10 E., M. D. M., 3 miles north of Forest Hill. Idle. Owned by W. A. Freeman Estate, Thomas Nichols, manager, Auburn.

Blue Eyes Prospect. Last Chance district. Sec. 32, T. 15 N., R. 13 E., and Secs. 5, 7, 8 and 17, of T. 14 N., R. 13 E., M. D. M., 2500 acres. Assessment work done on a bedrock tunnel. Channel not yet reached. Tunnel reported to be too high. Old hydraulic work was done in the Pine Nut pit. Owned by S. S. Caples, of Michigan Bluff.

Bogus Thunder. Michigan Bluff district. No information.

Bowen Mine. Michigan Bluff district. Sec. 10, T. 14 N., R. 11 E., M. D. M., 2 miles northeast of Michigan Bluff. Elevation 3400 feet. Bowen claim patented. Hold 2000 feet on a gravel channel. Assessment work only on other claims. Owned by Mrs. F. A. Bowen and sons of Michigan Bluff.

Brooklyn and Olympia Prospect. Last Chance district. Secs. 26, 35 and 36, T. 15 N., R. 12 E., M. D. M., one mile northeast of Last Chance. Elevation 4580 feet. Two hundred and thirty-five acres. Reported as one mile along a cement gravel channel. Tunnel 800 feet follows channel. Owned by Messrs. Threlkeld and Blohm, of San Francisco; W. T. Davis, superintendent, at Last Chance.

Burns Mine. Michigan Bluff district. Sec. 22, T. 14 N., R. 11 E., M. D. M., one-half mile north of Michigan Bluff. Elevation 3500 feet. Two hundred acres. Early work on cement gravel channel. Tunnel 800 feet. Shaft 130 feet. Channel lost. Assessment work only. Owned by the Michigan Bluff Mining Company; secretary, Wm. Burns, Placer County Bank, East Auburn.

Canada Hill Mine. Canada Hill district. Secs. 4, 5 and 9, T. 15 N., R. 13 E., M. D. M., 8 miles east of Westville. Elevation 6300 feet. Patented. Three hundred and ten acres. Reported to have one mile along a channel of free wash gravel. Old tunnel 1500 feet caved. New tunnel has entered gravel. Twelve men employed in November, 1915. Owned by Mr. E. H. Armstrong, of Grass Valley.

Carey Mine. Iowa Hill district. Sec. 27, T. 15 N., R. 10 E., M. D. M. At Monona Flat. Elevation 3200 feet. One hundred and twenty acre claim. Cement gravel channel with slate bedrock and andesite capping. Course of channel N. 20° W. Tunnel 250 feet. Some drifting. Channel is reported to be from 6 inches to 4 feet deep and 100 feet wide. One thousand eight hundred pound hand-cars are used to carry the gravel to a bin, where it is washed by water from Indian Cañon. Work is carried on all year. Two men work and mine about

18 cars per day. The gravel averages \$1.00 per car. Owned and operated by Mr. Bonham, of Iowa Hill.

Cedar Creek Mine. Dutch Flat district. Sec. 3, T. 15 N., R. 10 E., M. D. M., $1\frac{1}{2}$ miles south of Dutch Flat. Elevation 3500 feet. Four hundred and sixty acres. Reported to embrace $1\frac{1}{2}$ miles along a channel of free wash gravel. A bedrock tunnel 7 feet x 9 feet is 2200 feet long. The gravel channel is reported to have been about 40 feet wide. Of the four upraises, only one is open. Idle. Property in charge of Mr. F. K. W. Devey, of Blue Cañon. Owned by J. L. Gould, of Alameda.

Bibl.: Rep. VII, p. 206.

Copper Bottom Mine. Iowa Hill district. Patented. Idle. Owned by John Peters, of Sheridan.

Dam Mine. Damascus district. Secs. 23 and 26, T. 15 N., R. 11 E., M. D. M., $2\frac{1}{2}$ miles southeast of Damascus. Elevation 3715 feet. Patented 174 acres. Reported to have had four miles along a channel with free wash gravel 500 feet deep. Main 7500-foot tunnel is caved. Power plant removed. Idle. Owned by the Damascus Mining Company, Margaret Ogden, president, Monadnock Building, San Francisco.

Damascus or Sunny South Mine. Damascus district. Secs. 14, 15 and 23, of T. 15 N., R. 11 E., M. D. M., one mile southeast of Damascus. Elevation 3748 feet. One thousand five hundred and forty-eight acres of claims. White and blue cement gravel channels 900 feet deep. Tunnel 9000 feet. Worked out. Idle. The Red Point Mine is said to be on a continuation of the same channel. Owned by the Hidden Treasure Mining Company, of Michigan Bluff; H. T. Power, 625 Call Building, San Francisco.

Dardanelles Mine. Forest Hill district. Secs. 34 and 35, T. 14 N., R. 10 E., M. D. M., $1\frac{1}{2}$ miles southwest of Forest Hill. Elevation 2600 feet. Patents, Dardanelles and Oro. Area 312 acres. Reported to be a 2500-foot channel of cement gravel on slate. Tunnel 3000 feet. Handwork. Two men working. Car capacity one ton. Work about four tons per day, tumeling, and eight tons per day breasting. Gravels average about \$1.50 per ton. Prospect work only by the leasers. Owned by T. L. Chamberlain, of Auburn. Leased by Chester F. Bowman and Samuel G. Bowman, of Forest Hill.

Devil's Basin Consolidated. Includes the Lofruth Mine. Deadwood district. Sec. 1, T. 14 N., R. 11 E., and Sec. 25, T. 14 N., R. 10 E., M. D. M., $\frac{1}{2}$ mile north of Deadwood. Elevation 3700 feet. Claims: Harkness, Washington, Elk Horn, Devil's Basin Consolidated, Devii's Basin and Rattlesnake. Tunnel 5000 feet. Worked by the owners,

R. Lofruth, of Deadwood, and J. E. Ferguson, of Michigan Bluff, who employ two men. Some good gravel is said to have been struck in October, 1915, which ran \$3.50 per car.

Devil's Gate. H. G. Munger, 525 Adler St., Portland, Ore.

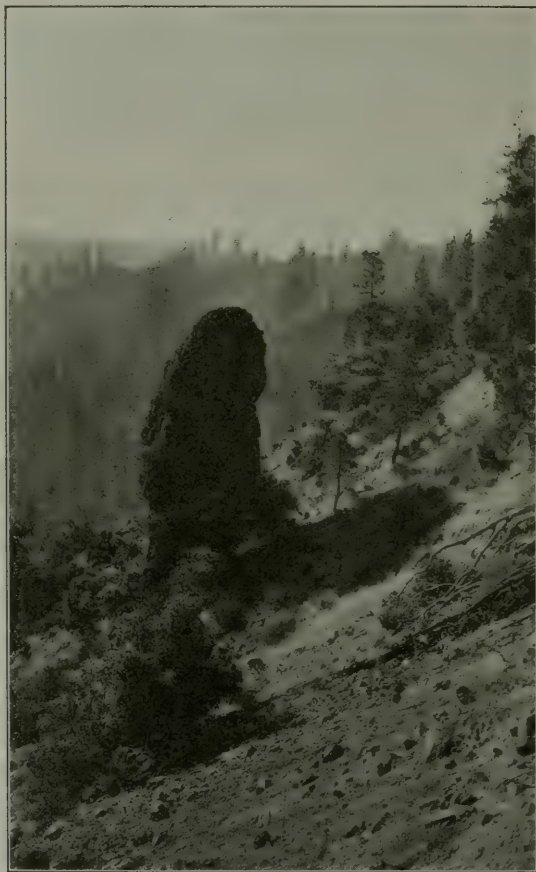


Photo No. 11. Devil's Horn, in Devil's Basin, on the eastern slope of Deadwood Ridge, at head of the trail to Last Chance. The "horn" shows how the andesite has intruded the slates and gravels in places.

Dewey Consolidated Mine. Iowa Hill district. Secs. 33 and 34, T. 15 N., R. 10 E., M. D. M., $\frac{1}{2}$ mile southeast of Iowa Hill. One hundred and thirty-seven acres. Running tunnel to strike what is supposed to be a part of the "Blue Lead" channel. Property recently surveyed.

Owned by A. and B. Rossi, of Sacramento ($\frac{1}{2}$), and P. T. Langenour, J. W. Monroe, J. L. Stephens, Harvey Willoughby, Daniel Woods and J. P. Keene, of Woodland; and Manuel Chapman and Ralph Sparks, of Winters ($\frac{1}{2}$). J. P. Keene is superintendent.

Dixie Queen Mine. Last Chance district. Secs. 9, 16 and 17, T. 14 N., R. 13 E., M. D. M., 9 miles southeast of Last Chance on the west side of Duncan Cañon and south of the Blue Eyes property. Elevation 4000 feet. Two hundred and forty acre claim. Cement gravel channel on slate with capping of andesite. Course of channel SW. Tunnel 700 feet. Breasted for 240'; 600' of crosscuts. Gravel washed in sluice boxes by water from Duncan Creek. Cars hold 1800 lbs. Equipment consists of: hand outfit for 8 men, shop and cabin. Two men work steadily and employ two others. Gravels average \$1.00 per car. Said to have been \$5000.00 taken out since 1906. Owned by Joseph Scherer and John Franks, of Last Chance.

Dutch Flat Blue Lead. Dutch Flat district. Sec. 3, T. 15 N., R. 10 E., M. D. M. Small patented claim adjoining the Federal Drift Mine. Cement gravel, blue lead. Gravel from 50 feet to 110 feet deep. Tunnel 1000 feet. Shaft 400 feet. Owned by C. S. Jordan, of Dutch Flat, and J. L. Gould, of 16 Ensloe Ave., Alameda.

Dyer or Wisconsin Mine. Dutch Flat district. Sec. 35, T. 16 N., R. 10 E., M. D. M., $\frac{1}{2}$ mile west of Dutch Flat. Elevation 2800 feet. Twenty acres. Cement blue gravel channel in slate. Channel 300 feet. Tunnel 800 feet. Seven men drifting and breasting. Gas engine runs air compressor equipped with one Sullivan air drill. Distillate costs \$0.12 per gallon at the property. Gravel is washed in hopper with 100 feet of sluice boxes. Owned by J. L. Gould, 16 Ensloe Ave., Alameda. Leased by Messrs. Fred Husler and Chas. Wachter, locally known as the "Swiss Boys."

Eagle Bar Mine. Forest Hill district. Wm. Duffy, Forest Hill.

Elite. Dutch Flat district. Secs. 31 and 32, T. 16 N., R. 11 E., M. D. M., one mile southeast of Shady Run. Elevation 3950 feet. Four hundred and twenty-five acres. Gravel reported to be 500 feet deep. Shaft 153 feet. Tunnel 1100 feet. Idle. Owned by R. Monroe et al., of Dutch Flat.

Eureka. Damascus district. Includes 3,000 acres in Secs. 17, 18, 19 and 20, in T. 15 N., R. 12 E., and in Secs. 24 and 25 of T. 15 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles southeast of Forks House. Elevation 4400 feet. Free wash gravel. Tunnel 4000 feet. Prospecting only at present. Owned by the Eureka Consolidated Drift Mining Co.; J. A. Ferguson, superintendent, Forest Hill, and Chas. Leach, U. S. Mint.

Excelsior. Forest Hill district. Sec. 26, T. 14 N., R. 10 E., M. D. M. Worked through the New Hope, 3500 foot bed-rock, tunnel with

portal in Sec. 35, T. 14 N., R. 10 E., M. D. M. One-half mile southeast of Forest Hill. The channel is on the Blue Lead and was located in the early 70's but was not worked until 1913. The company now owns all claims between the Dardanelles and the Gore, including also the Banner and the Garland Mill Slope, including about 2000 acres. The channel northeast of here has all been worked out through the Mayflower and Paragon tunnels. The channel varies from 20 feet to 100 feet wide and has a course about N. 20° E. The bed rock is slate and the cement blue gravel requires blasting. Work consists of drifting along the channel and stoping out the chambers. Mine equipment consists of a 350-cubic-foot air compressor and eight Ingersoll and Sullivan air drills. Electric power, 700 h. p., is brought from Horseshoe Bar.

The gravel is screened through a revolving grizzly lined with T-rails and the fine material run through a 6-stamp triple discharge mill. Six months gravel was blocked out when visited in September, 1915. Water is obtained from the tunnel, through which drain the old Harley shaft and Independence slope. Owned by Excelsior Gold Mines Co., Inc., M. Jenks, president, San Francisco; R. B. Elder, manager, Berkeley.

Federal Drift Mine. Dutch Flat. Sec. 34, T. 16 N., R. 10 E., M. D. M. Elevation 3000 feet. Patented land in town of Dutch Flat. One hundred and twenty-five acres. Slate bed rock. Channel thought to be a branch of the Dutch Flat Blue Lead and strikes approximately N. 80° E. A two-compartment vertical shaft over 80 feet deep struck gravel in November, 1915, but water was encountered. A mule whim was used for hoisting and five men were employed. Owned by the Federal Drift Mining Company, Dr. W. B. Coffey, president; W. T. Watson, superintendent, Dutch Flat.



Photo No. 12. View eastward towards the town of Dutch Flat. The X in center marks the location of the Federal Drift shaft.

Fitzpatrick. Iowa Hill district. Sec. 32, T. 15 N., R. 10 E., M. D. M., one mile west of Iowa Hill. Tunnel 2000 feet. Two men prospecting on an old property. Owned by M. E. Poor, Monona Flat, Iowa Hill.

Florida. Forest Hill district. Sec. 25, T. 14 N., R. 10 E., M. D. M., one mile northeast of Forest Hill. Elevation 3550 feet. Patented. Cement channel. Tunnel 650 feet. Some development work being done. Owned by Mr. Rice.

Flying Fish. Dutch Flat district. Sec. 34, T. 16 N., R. 10 E., M. D. M., $\frac{1}{2}$ mile southwest of Dutch Flat. Elevation 3100 feet. Ten acres. Cement gravel. Idle. Owned by Ed. C. Uren, Nevada City.

Franklin. Michigan Bluff district. Sec. 10, T. 14 N., R. 11 E., M. D. M., 2 miles northeast of Michigan Bluff. Elevation 3400 feet. Tunnel 800 feet. Expect to strike Bowen channel in another 100 feet. Two men employed. Owned by A. Dixon, of Michigan Bluff.

Gleason Mine. Iowa Hill district. Said to be three miles southeast of Iowa Hill. Patented. Cement gravel channel with slate bedrock. Idle. Owned by Gleason Consolidated Mining Co., 3793 Twentieth St., San Francisco; Miss M. T. Gleason, Iowa Hill.

Glenn Mine. Last Chance district. Secs. 22, 27, 28 and 34, T. 15 N., R. 13 E., M. D. M., 6 miles east of Last Chance. Elevation 5000 feet. Cement channel on the northwest side of Duncan Cañon. Drifting up the channel has been carried on recently by Mr. F. A. Moss, who with Mr. M. C. Threlkeld, leases the property from the owners, G. R. Cowen, of San Francisco, Geo. McCauley and K. A. Robinson, of Auburn.



Photo 13. Glenn Mine, eight miles east of Last Chance, Placer County.

The course of the lower channel is N. 60° W. and it has been covered with andesite. A later channel deposited gravels on top of the andesite and was capped by a more recent lava flow. The bedrock consists of schist and is steep and cut full of potholes. The pay gravel is from 10' to 100' wide. Equipment consists of shop, tools, snowsheds, bunk house and superintendent's house. Former work seemed to have been northeast of the channel, and considerable work was done by the present operators before the channel was opened up.

Gold Ring or J. D. Peters Mine. Dutch Flat district. Sec. 1, T. 15, N., R. 10 E., M. D. M., $2\frac{1}{2}$ miles southwest of Towle. Elevation 1500 feet. Sixty-three acres. Cement gravel channel 30 feet wide. Idle. Owned by Mr. West, of Green Valley, or Towle.

Golden Channel. Blue Cañon district. Sec. 1, T. 16 N., R. 11 E., M. D. M. Elevation 4800 feet. One and one-half miles southwest of Emigrant Gap. Patented. Four hundred and eighty acres. Reported as free wash gravel 130 feet wide. Could not find a pay channel. Shaft 105 feet. Idle for 14 years. Owned by J. W. Hyatt, Emigrant Gap.

Golden Nugget. Blue Cañon district. Sec. 12, T. 16 N., R. 11 E., M. D. M., two miles northeast of Blue Cañon. Elevation 4000 feet. Patented 640 acres. Reported to include one mile of channel, carrying free wash gravel 450 feet deep and 75 feet wide. Tunnel 325 feet. Idle. Owned by C. M. Everhart, of Gold Run.

Golden River or Red Point Mine. Damascus district. Secs. 12, 13, 14, 23 and 24, T. 15 N., R. 11 E., and Secs. 3, 4, 5, 6, 7, 8 and 18, of T. 15 N., R. 12 E., M. D. M., one mile north of Forks House. Elevation 3827 feet. Patented. One thousand feet of free wash gravel. Tunnels over 18,000 feet. The gravel is said to have been about worked out. Idle. Owned by the Société des Mines de Golden River, of Paris, France. Leased to Messrs. Bird and J. A. Ferguson, of Forest Hill.

Golden Sheaf. Michigan Bluff district. E. S. Thompson, Michigan Bluff.

Golden Star. Iowa Hill district at Succor Flat. Tunnel, 675 feet. Prospecting for blue gravel. Owned by N. E. Booth and R. L. Wills, of Auburn. Leased to Robert McClanahan, of Iowa Hill.

Golden Streak. Iowa Hill district. Said to be a channel 80' wide, 5000' long and varying from 0' to 8' deep capped by 400' of lava. A 1200' bedrock tunnel is contemplated to reach the gravels.

Owned by the Golden Streak Mining Co., Henry Lobner, F. H. and Walter Schulze, F. D. Kuenzley, and P. W. Crider, of Colfax.

Golden West. Canada Hill district. Secs. 4 and 5, T. 15 N., R. 13 E., M. D. M., eight miles east of Westville. Elevation 6500 feet. Claims: Big Hill (150 acres) and Bunker Hill (140 acres). Patented 400 acres. Claim 1 mile along a channel, of red and blue gravel, 130' wide. Development work consists of an incline shaft and a 2200' bed-rock tunnel which, it is said, lacks only 200' of work to reach the channel. Some gravel from an upper tunnel is said to have run \$5.00 per car. The operators are reported about to resume work after four years idleness. E. H. Armstrong, of Grass Valley, manager.

Gorman Mine. Michigan Bluff district. Sec. 27, T. 14 N., R. 11 E., M. D. M., one mile south of Michigan Bluff. Drifting in cement gravel channel. Owned by A. Gorman, of Michigan Bluff.

Grey Eagle. Forest Hill district. Secs. 5 and 6, T. 13 N., R. 10 E., M. D. M., five miles southwest of Forest Hill, on Owl Creek. Elevation 2400 feet. Hold all claims eastward to the Franklin and are negotiating for others, which will extend the holdings to the San Francisco claim. Present holdings include about 6000 feet of cement gravel channel with a volcanic capping. The gravel averages 5 feet thick and 50 feet wide. Little timbering is necessary. Present working consists of a 3000-foot bedrock tunnel in slate, which crosscuts the E.-W. channel. Drifting has been carried eastward along the channel for 4000 feet. The gold is fine like bran, the largest pieces being valued at about \$1.00. Tunneling costs about \$11.00 per foot. When visited in October, 1915, the mine equipment consisted of an air compressor and six air drills. The gravel is drawn in one-ton cars by a horse to an old 10-stamp mill, repaired for temporary use. The camp included an office and bungalow, warehouse, shop, change room and 12 bunk houses. Water is pumped from the mine by one 2-inch centrifugal pump, one 4-inch single acting pump and one 7-inch duplex pump, which lift 10 inches of water 50 feet. Electricity is obtained from the Excelsior line, owned by the Pacific Gas and Electric Co., and costs $1\frac{1}{2}$ cents per K. W. H. Twelve men were employed. Freight from Auburn costs $\frac{1}{2}$ cent per pound.

New equipment contemplated consists of a revolving screen and conveyor belt; a three-stamp triple discharge Hendy mill with 24-mesh screen. The fine gravel will be run through sluices, while all gravel 1 inch or over will be crushed.

Owned by the California Chief Development Co.; Walter Fitch, president, Eureka, Utah; Chas. L. Austin, manager, Forest Hill.

Hard Climb. Last Chance district. Secs. 3 and 9, T. 14 N., R. 13 E., M. D. M., 6 miles southeast of Last Chance, on Duncan Ridge on the southeast side of Duncan Cañon. Elevation 4000 feet. Four hundred acres in claims. A lava capped channel is worked by those

interested when water is available. In 1908 a tunnel was run 75 feet into gravel and some gold taken out. About 60 feet lower and 1000 feet north of the first tunnel, another tunnel was run 40 feet on the channel, but the gravel encountered did not carry much value. A new 200' tunnel, in conglomerate and 50' of gravel, is said to look promising. Owned by F. M. Tillotson, Hiram W. McCullough and Chas. H. Hilton, of Last Chance, and Mrs. Mary Haviland, of Michigan Bluff.

Hassler. Ophir district. In Long Ravine, 2 miles southeast of Auburn on the road to Folsom, Sec. 28, T. 12 N., R. 8 E., M. D. M. Prospecting is being carried along a NW.-SE. channel, said to be 2''-12' deep, 75' wide and 1000' long. The channel is capped with lava, gravel, mud, etc. Development consists of a 340' incline shaft on an angle of 30°. The values are said to run out to the rims of the channel on the bedrock. Equipment consists of a 25 h. p. steam hoist used to raise the gravels, and a 1600 lb. car. The gravels are said to run from \$4.00 to \$14.00 per ton, and 150 cars are on the dump ready for washing.

Owned by Harold Powers, San Francisco, and E. C. Gaylord et al., of Auburn. Leased by J. W. Wright, Frank Wooldridge and G. P. Johnson of East Auburn.

Haub. Dutch Flat district. Sec. 28, T. 16 N., R. 11 E., M. D. M., $\frac{1}{2}$ mile northeast of Shady Run. Elevation 3720 feet. Thirty-three acres. Reported as free wash white gravel. Channel 40 feet wide. Tunnel 960 feet. Shaft 30 feet. Some work being carried on. Owned by Robert Watson, of Blue Cañon.

Bibl.: Register of Placer County Mines, 1902, Cal. State Min. Bur.

Hermit or Great Channel. Michigan Bluff district. Sec. 3, T. 14 N., R. 11 E., M. D. M., four miles north of Michigan Bluff. Elevation 3400 feet. Free wash gravel. Shaft 75 feet. Tunnel 2200 feet. Idle. Owned by Mrs. Bowen and sons, of Michigan Bluff.

Hidden Treasure. Damascus district. Secs. 26, 27, 34 and 35, of T. 15 N., R. 11 E., M. D. M., 5 miles north of Michigan Bluff. Elevation 3644 feet. Patented 1545 acres. Reported as free wash gravel. Channel 300 feet wide. Tunnel 8300 feet. Electric power was used for traction, hoisting, pumping and blower. Idle since fall of 1914. Owned by the Hidden Treasure Mining Co., of Michigan Bluff; Harold T. Power, secretary, 625 Call Building, San Francisco.

Bibl.: Rep. VIII, p. 469; Rep. IX, pp. 29-120; Rep. X, p. 451;

Rep. XII, p. 209.

Hogsback Mine. Canada Hill district. Secs. 2 and 3, T. 15 N., R. 12 E., M. D. M., three miles east of Westville. Elevation 4524 feet. Patented 1545 acres. Reported as free wash gravel. Tunnel 2500 feet. Thought to be the same channel that was worked at Red Point. Idle. Owned by Compagnie des Mines et Minerais, 26 Rue de Chateaudon, Paris, France; J. A. Ferguson, superintendent, Forest Hill.

Bibl.: Rep.VIII, p. 472.

Homestake. Forest Hill district. Sec. 31, T. 14 N., R. 11 E., M. D. M., two miles south of Bath, in Volcano Cañon. Elevation 1260 feet. Idle. Owned by M. Savage, of Forest Hill.

Home Ticket. Last Chance district. Secs. 26 and 35, T. 15 N., R. 12 E., M. D. M., one mile east of Last Chance. Elevation 4700 feet. Twenty-one claims. Cement gravel channel in slate averages 7 feet thick. A channel with a northerly direction is cut by one with an east-west course. Tunnel 4300 feet. The gravel is mined by hand work and then washed in hoppers by water from a reservoir in Grouse Cañon, owned by the Pacific Slab Mine. During the dry season scarcity of water compels them to chute the water for sluicing. Between 15 and 20 men are employed. Owned by J. F. Thompson, of Bath, and others. Frank B. Keefer, president, San Francisco. Leased by D. M. Ray, of Last Chance.

Indiana Hill. Dutch Flat district. Secs. 9 and 10, T. 15 N., R. 10 E., M. D. M., $1\frac{1}{2}$ miles southeast of Gold Run. Assessment work only. Owned by J. L. Sparhawk, Iowa Hill.

Jack Robison. Last Chance district. Sec. 16, T. 14 N., R. 13 E., M. D. M. Elevation 4070'. An 80' tunnel in loose gravel has penetrated a blue gravel. Equipment consists of bunk house and shop. The gravels are sluiced by water dammed up from the mine. The channel is thought to run diagonally across the ridge in a NE.-SW. direction. Owned by S. S. Caples, Michigan Bluff.

Jarvis or Bob Lewis Mine. Damascus district. Secs. 14 and 15, T. 15 N., R. 11 E., M. D. M., $\frac{1}{2}$ mile northeast of Damascus. Elevation 3850. One hundred and sixty acres. Cement gravel channel said to be 400 feet wide. Fourteen hundred foot tunnel. Owned by H. M. Jarvis, of Mobile, Alabama. Leased to Geo. Brown, Orin Jones, Jack Creighton and Bob Craig, of Last Chance, who have been drifting along the channel and producing since June, 1915.

Jupiter Consolidated. Iowa Hill district. Sec. 11, T. 14 N., R. 10 E., M. D. M., $3\frac{1}{2}$ miles southeast of Iowa Hill. Patented 250 acres. Reported to have a channel one and one-half miles long in free wash gravel on the north side of Shirttail Cañon. Shaft 250 feet. Idle. Owned by the McGeachin Company.

Live Oak. New England Mills (Weimar) district. Sec. 22, T. 14 N., R. 10 E., M. D. M., 2 miles northeast of Weimar in Live Oak ravine. Elevation 2000 feet. Owned by the Geisendorfer Estate. Bonded to Dan J. Williams, of Weimar.

Lost Camp. Blue Cañon district. SE. Corner of Sec. 23, T. 16 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles southeast of Blue Cañon on the north fork of the North Fork of the American River. Elevation 4500 feet. Six hundred acres. Tunnel 300 feet. Now operated as a hydraulic mine. Owned by George F. Miller, of Blue Cañon.

Macedon Mine. Canada Hill district. Sec. 1, T. 15 N., R. 12 E., M. D. M., four miles east of Westville. Elevation 5000 feet. Patented 110 acres. Reported to have 3000 feet along a free wash gravel channel which is about 70 feet wide. Tunnel 200 feet. Owned by Dr. C. W. Richards and Mrs. A. Snyder, of Sacramento, and Mr. Rey, of the Britton & Rey Co., San Francisco.

Maguire, or Foss Mine. Dutch Flat district near Lowell Hill. Worked by drifting in the early days. Wm. Maguire and wife the present owners reported to be going to hydraulic the gravels.

Marian Mine. Michigan Bluff district. Sec. 35, T. 14 N., R. 11 E., M. D. M., two miles south of Michigan Bluff. Elevation 3800 feet. One hundred and eighty-five acres in claims. Cement gravel channel in slate with andesite capping. Tunnel 600 feet. Development work only. The owner expects to strike the channel in about 50 feet. Owned by E. A. Hills, of Michigan Bluff.

Maus Tunnel. Forest Hill district. Sec. 36, T. 14 N., R. 10 E., M. D. M., one mile east of Forest Hill. Elevation 3000 feet. This claim lies between the Excelsior and the Paragon properties, but does not extend northwestward as far as the probable course of the Blue Lead channel. Tunnel 1000 feet. It is reported that 500 feet more of tunnel with raises will be run.

Bibl.: Grass Valley Union, October, 1916.

Mayflower Mine. Forest Hill district. Parts of Secs. 22, 23, 24, 25 and 26, T. 14 N., R. 10 E., M. D. M., two miles northwest of Forest Hill. Elevation 2700 feet. Claims: Eastern, Portuguese and Brushy Slide. Patents: You Bet, Center Hill, Orono, Hancock and Watson, Banner, Coates, Slater, Live Oak, Rockby Point, High Run, Justice, Nil Desperandum, Gore and Freeze Out. Twenty-six hundred acres. Three cement gravel channels in slate. The Orono channel averages 40 feet wide, and a 3500-foot bedrock tunnel has been driven in mining it. The Blue Lead channel averages 300 feet wide, and a 14,800 foot bedrock tunnel has been driven in course of mining it. The Upper Lead channel averages 250 feet wide and a 3500-foot tunnel in bedrock and gravel has been driven. In a shaft which was sunk to bedrock,

about 325 feet of blue gravel was passed through. Drifting is being carried on in all three of these channels. Two air compressors serve seven machine drills and a forge. The gravel is trammed in $1\frac{1}{2}$ -ton cars.

Water and steam power are used, depending on the abundance of water and time of year, to run a 20-stamp mill which crushes the gravel. The pulp passes over amalgamation plates and then over riffles. Sixteen men are employed and the miners move about $3\frac{1}{2}$ cars of gravel per man per day. It is claimed that the net production of this mine during the last forty years has been about \$3,600,000.

Owned by the Mayflower Gravel Mining Company; Geo. L. Duffy, president, 2352 Mission Street, San Francisco.

Missouri Mine. Forest Hill district. Secs. 33 and 34, T. 14 N., R. 10 E., M. D. M., one mile southeast of Yankee Jim's. Elevation 2650 feet. Tunnel run but apparently struck little gravel. If carried southward into the San Francisco claim, this tunnel might encounter gravel. Idle.

Mohawk. Iowa Hill district. Sec. 26, T. 15 N., R. 10 E., M. D. M., three miles north of east of Iowa Hill on Succor Flat. Elevation 3200 feet. Claims: Gravel channel, with a north-south course, in amphibolite. Incline shaft. Two men said to have been working for two years. Hand labor. Owned by N. E. Booth, of Colfax.

Monumental. Canada Hill district. Sec. 4, T. 15 N., R. 13 E., M. D. M., 8 miles east of Westville. Elevation 5300 feet. Five claims.



Photo 14. Tunnel entrance to Monumental Mine, Canada Hill District, Placer County.

Two hundred acres. Adjoins the Golden West property. A gravel channel running N. 60° W. is about 80 feet wide, with andesite capping. Tunnel 400 feet with some drifting. A 5 h. p. gasoline

engine is used to run a barrel mill 8' long x 30" in diameter for loosening up the values. Eighty feet of sluice boxes. Three men work all year. Eighteen hundred feet of Reed channel worked out. Some gravel is poor while other carries values up to \$8.00 per car. Owned by Peter F. Hinst, E. W. Smith and A. A. Bissell, of Westville.

Moody Ridge. Dutch Flat district. Secs. 3 and 10, T. 15 N., R. 10 E., M. D. M., two miles east of Gold Run. Elevation 3650 feet. Patented 120 acres. Some tunneling. Remains undeveloped. Owned by Mr. Moody, of the Pacific Hardware Company, of San Francisco.



Photo No. 15. View northeastward up the railroad right of way near Gold Run, showing hydraulic gravel banks and pit to the right.

Morning Star. Iowa Hill district. Secs. 33 and 34, T. 15 N., R. 10 E., M. D. M., one mile northwest of Iowa Hill. Elevation 2700 feet. Patented 160 acres. Reported to have 5500 feet along a gravel channel. Tunnel 4800 feet. Shaft 488 feet. Idle. Owned by the McGeachin Co., H. T. Power, Call Building, San Francisco.

Bibl.: Rep. VIII, p. 472; Rep. IX, p. 29; Rep. X, p. 420; Rep. XII, p. 211.

Mountain Chief. Michigan Bluff district. Sec. 34, T. 14 N., R. 11 E., M. D. M., $1\frac{1}{2}$ miles south of Michigan Bluff, northwest of the North Fork of the American River. Idle. Owned by Fred Outhouse, of Forest Hill.

New Baccarat. Lincoln district. Sec. 23, T. 12 N., R. 6 E., M. D. M., three miles southeast of Lincoln. Shallow drifting in residual gravels. One hundred and sixty acres. Tunnels 325 feet. Idle. Owned by Lincoln parties.

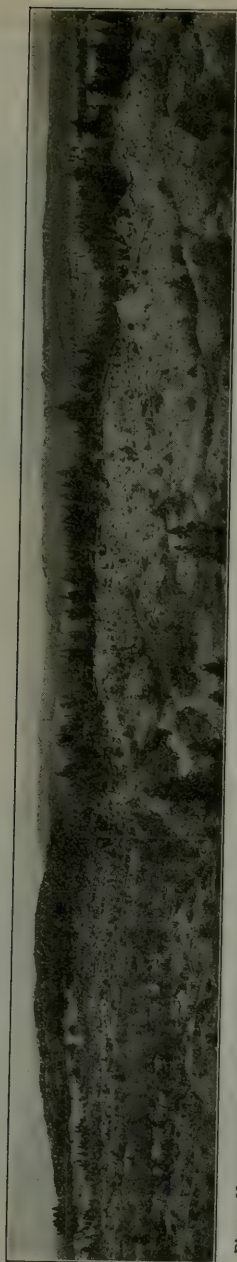


Photo No. 16. Panorama of old hydraulic workings at Gold Run, showing the proximity of the old working face to the railroad right of way to the left. The cement gravels in the bedrock still remain to be worked.

New Basil Consolidated. Canada Hill district. Secs. 2, 3, 10 and 11, T. 15 N., R. 12 E., M. D. M., $2\frac{1}{2}$ miles east of Westville. Elevation 4900 feet. Three hundred and eighty acres. Cement gravel channel. Tunnel 3000 feet ran out of channel. Shaft 160'. The Black Cañon Quartz Mine occupies a portion of this property, and it is intended to obtain electric power from the Black Cañon Power Line for driving a new shaft. Idle. Owned by R. F. McLeod, 350 California St., San Francisco.

North America Prospect. Dutch Flat district. Secs. 28 and 29, T. 16 N., R. 11 E., M. D. M., one mile northeast of Shady Run or Midas. Tunnel 150 feet. Idle. Owned by L. K. Develey and brother, of Blue Cañon.

Occidental. Iowa Hill district. Sec. 3, T. 14 N., R. 10 E., and Sec. 34, T. 15 N., R. 10 E., M. D. M. Elevation 3300 feet. Patented 171 acres. Cement gravel channel. Tunnel 3100 feet. Probably worked out. Idle. Owned by W. E. Wretman, Garden City Bank Bldg., San Jose.

Oro. Michigan Bluff district. Sec. 10, T. 14 N., R. 11 E., M. D. M., $2\frac{1}{2}$ miles northeast of Michigan Bluff. Elevation 3500 feet. Idle for several years. Owned by A. Dixon, of Michigan Bluff, as are also the Willey and Yule and Willey claims which lie north of the Turkey Hill consolidated.

Outhouse Consolidated or Sellier Mine. Damascus district. Sec. 34, T. 15 N., R. 11 E., M. D. M., 6 miles north of Michigan Bluff. Nine hundred and twenty acres. Claims: Never Fail (160 acres), Maintop (160 acres), Electric (160 acres), Golden Promise (160 acres), Up-to-Date (160 acres), and Brimstone (120 acres). A 310-foot shaft on the Mountain Sheaf claim is said to have struck the rim of a channel. Assessment work is being carried on in this shaft and in a shaft on the Georgia claim. Using a 12 h. p. gasoline engine to pump water. Three men employed. Owned by the Outhouse Consolidated Mining Co., Mr. Fred Outhouse, president, Forest Hill.

Pacific Blue Lead or George Fulton. Canada Hill district. Secs. 4 and 5, T. 15 N., R. 13 E., M. D. M. Elevation 6320'. Four hundred and thirty acres. Claim 1 mile along a blue channel 11' deep and 150' wide in which the gravel benches above the bedrock ran from \$0.50 to \$37.00 per car; also 1 mile along a white channel 6'-14' deep and 125' wide from which 1000 cars are said to have averaged \$2.50 per car. The channels run East-West and the main bedrock tunnel 450' long struck white gravel and crossed the channel into the rim of the blue

channel. The gravels are washed in sluice boxes and the tailings dumped into Flat Ravine.

Owned by Leo P. Harris, Westville or 2279 West Twentieth St., Los Angeles.



Photo 17. Camp, at the Pacific Blue Lead Drift Mine, Canada Hill District, Placer County.

Pacific Slab Mine. Last Chance district. Secs. 27, 28, 33 and 34, T. 15 N., R. 12 E., M. D. M., $1\frac{1}{2}$ miles southwest of Last Chance. Twelve miles by steep trail from Michigan Bluff. Five hundred and twelve acres. Claims: Pacific Slab, Bob Lewis, New York and Ohio. Discovered about 1852 and worked off and on ever since. The channel is in slate capped by andesite and the gravel is fairly well cemented. The pay gravel consists of the lower 5 feet of gravel above bedrock, but the



Photo No. 18. View eastward of the Pacific Slab Mine, Last Chance District, showing office, cook house, gravel bin and hydraulic monitor.

gravel is in places 20' to 50' deep. The channel has been followed for over 4000 feet. A 215-foot raise provides ventilation and entrance for supplies. Six-foot split pine costs \$9.50 per thousand, while 1½" x 6" x 5' lagging costs \$20.00 per thousand, and 3-foot lagging costs \$15.00 per thousand. The mine is equipped with a 6" x 6" Gardner air compressor, run by a 30" Pelton-Doble water-wheel under a head of 130', which serves air drills.

About 3500 feet from the portal of the tunnel a 40-foot channel 2' deep from the northeast has cut the main channel in two. In September, 1916, work was being carried on in the small channel by 4 men who took out about 8 cars of gravel per day. Owned by the Pacific Slab Consolidated Mining Co., M. C. Threlkeld, president, 1007 Monadnock Building, San Francisco; Chas. H. Blohm, secretary; W. T. Davis, superintendent at the mine.



Photo No. 19. Hydraulic bank above the old Paragon tunnel at Bath, Forest Hill District, showing lens-shaped gravel strata.

Paragon or Breece and Wheeler Mine. Forest Hill district. Secs. 19, 24 and 30, T. 14 N., R. 11 E., M. D. M., 2 miles northeast of Forest Hill. Elevation 2900 feet. Five hundred acres patented. Cement gravel channel in amphibolite and serpentine capped by andesite. A tunnel 1¼ miles long follows the channel and connects with the Mayflower tunnel. There are estimated to be about 15 miles of drifts. Three channels were worked. The main or "Blue Lead" channel averaged 300 feet wide and the gravel is said to have averaged \$4.50 per car of 16½ cubic feet. The Paragon channel, 150 feet higher than the "Blue Lead," averaged 45 feet wide and is said to have averaged \$10.00 per car. The Orono or volcanic channel averaged about 250

feet wide and the gravel is said to have averaged \$5.00 per car. The Paragon lead, to a distance of 3000 feet from the portal of the main tunnel, is said to have produced \$900,000. The Orono channel is said to have been worked for 1800 feet and produced \$75,000. The gravel was crushed in a Blake crusher and a 10-stamp mill. The pulp was passed over amalgamation plates and through sluice boxes and the tailings run into Volcano Cañon. Two men in the mine are doing development work to determine the direction of the Paragon channel at a point about one mile in the Blue Lead tunnel. Owned by J. F. Thompson, Box 178, Long Beach, Cal.

Penn Valley. Iowa Hill district. Sec. 27, T. 15 N., R. 10 E., M. D. M., at Monona Flat, $1\frac{1}{2}$ miles northeast of Iowa Hill. Elevation 3200 feet. Patented 120 acres. Gravel channel in amphibolite with gravel capping. Tunnel 3000 feet. Present work consists of prospecting. Owned by B. T. Jamieson and Robert Smith, of Iowa Hill.

Placer Gravel Gold or the **El Dorado Mine.** Last Chance district. Sec. 26, T. 15 N., R. 12 E., M. D. M., $\frac{1}{2}$ mile northeast of Last Chance. Elevation 4700 feet. Claims: El Dorado of 160 acres and others. Said to include 4000 feet along a cement gravel channel in slate. The channel course is approximately N. 35° W., and capped with andesite. The pay gravel is said to be 40 feet wide and 6 feet deep. Bedrock tunnel 4000 feet. Channel is worked through a 30-foot raise. Loaded cars run by gravity and each hold one ton of gravel. Each miner handles two cars of gravel per day. The mine lies north of the Home Ticket and is thought to be on the same "Big" channel which occurs in the Pacific Slab mine. It has been leased for the past two years by H. E. Gorman, Berry Griffin and Roy Anderson, of Last Chance. Owned by the Pacific Slab Gold Mining Company; Mr. D. M. Ray, of Last Chance, part owner. Marshal Sherbert, secretary.

Placer Queen. Canada Hill district. Eighteen miles east of Westville. Elevation 6230'. A 3000' tunnel is said to have been run but to have been above the channel. A lower tunnel is contemplated to strike the channel which is thought to run E.-W. towards Canada Hill. Owned by the Placer Queen Gold Mining Company. Leased by W. Duffy, of Michigan Bluff.

Ralston Divide Gravel Mine. Ralston Divide district. Secs. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, of T. 13 N., R. 12 E., Secs. 4, 5, 6, 7, of T. 13 N., R. 13 E., Secs. 22, 23, 27, 28, 31, 32, 33, 34, of T. 14 N., R. 13 E., and Secs. 34 and 35, of T. 14 N., R. 12 E., M. D. M. Elevation 3500 to 5000 feet. Ten thousand acres. Reported to have 10 miles along the Ralston Divide capped with andesite, which is underlain by gravel channels. Considerable prospecting has been carried on for several years. Scarcity of water permits work to be carried on only part of the year. In September, 1916, 8 men were doing hydraulic and drift work on the

Pat Goggins property on the Ralston Divide. Owned by the California and Hawaiian Development Co., Alaska Commercial Building, San Francisco; W. Duffy, manager, Michigan Bluff.

Red Star. Last Chance district. Three miles east of Last Chance. Claims: Red Bird No. 1 and Red Bird No. 2. The Buena Vista claim adjoins Red Bird No. 1 to the south. The channel appears to be rather scattered and no good values have been found. Old 250' tunnel with two branches in search of pay gravel. New 325' tunnel with two 50' branches. Water is obtainable by a long ditch from Duncan Cañon. At present water is taken from the tunnel. Gravel from the old tunnel is said to have run about \$0.10 per car. Equipment consists of shop, car, and tools. Assessment work only, by D. M. Ray and M. Savage of Forest Hill. Was bonded by Graham and Cates, Pacific Building, San Francisco, who did considerable development work.

Reed Mine. Canada Hill district. Sec. 8, T. 15 N., R. 13 E., M. D. M., 8 miles east of Westville. Elevation 6000 feet. Reed claim, 80 acres; White claim, 70 acres. Cement gravel channel, with NE.-SW. course, in schist. Tunnel 1800 feet. The pay gravel is reported to be 100 feet wide and 5 feet thick. Drifting under the old hydraulic works is said to have about worked out the channel. Owned by Mr. J. D. Meredith, of Grass Valley. Bonded to Mr. Henry Snyder, of Canada Hill.

Rough and Ready. Forest Hill district. Secs. 35 and 36, T. 14 N., R. 10 E., M. D. M., one mile east of Forest Hill. Idle. Channel probably worked out.

Sailor Cañon. Canada Hill district. Sec. 34, T. 16 N., R. 13 E., M. D. M. Patented. Cement gravel channel. Reported as having an 1800-foot tunnel. Some gravel is said to have run \$2.00 per car. Idle. Owned by the Sailor Cañon Gravel Mining Company; W. H. Duffy, superintendent, San Francisco.

Bibl.: Rep. X, p. 426.

Santa Fe. Iowa Hill district. Ten acres in claims. Tunnels: No. 1, 1000 feet; No. 2, 400 feet, are said to lie above and below the Canada Hill channel. Thought to be the same channel as that found at the Monumental mine. Owned by Morgan Green & Co., of Auburn.

Shaw Brothers Mine. Dutch Flat. One-half mile south of Alta. Idle. Shaw Brothers, deceased.

Shell or Shackleton. Blue Cañon district. Said to have $\frac{3}{4}$ mile along a lava capped channel. An old tunnel, now caved, was in 4' of wash gravel. A slide is said to have covered up the ravine, and work thus far has consisted of building a reservoir and washing off the loose slide material. Where bedrock has been exposed good values have been found. The owners intend to begin drifting soon. Owned by Perry and A. V. Shell, of Blue Cañon.

Small Hope. Forest Hill district. Sec. 27, T. 14 N., R. 10 E., M. D. M., $3\frac{1}{2}$ miles north of Forest Hill. Forty acres. Cement gravel channel. Reported to have 2000 feet of tunnel. Idle. Owned by Mr. Federer and James Nicholson, of Sacramento.

Bibl.: Rep. XII, p. 212.

Southern Cross. Dutch Flat District. Sec. 34, T. 16 N., R. 10 E., M. D. M., $\frac{1}{4}$ mile northeast of Dutch Flat. One hundred and forty acres. Gravel channel reported to be 40 feet wide. Tunnel 300 feet. Idle. Owned by George Nicholls, of Dutch Flat.

Bibl.: Register of Mines, 1902, Cal. State Min. Bur.

Spring Garden Consolidated. Forest Hill district. Secs. 5, 6, 7 and 8, T. 13 N., R. 10 E., M. D. M. Patented 530 acres. Reported to include 5000 feet along a gravel channel. Owned by N. W. Nash, of Sterling, Cal. Reported sold at sheriff's sale on Aug. 10, 1915, for \$1,650.00.

Bibl.: Auburn Herald, Aug. 14, 1915.

St. George. Forest Hill district. Sec. 33, T. 14 N., R. 10 E., M. D. M., $1\frac{1}{2}$ miles southeast of Yankee Jim's. Elevation 2700 feet. Idle. A. M. Colwell, manager, at Yankee Jim's.

Starr Mine. Last Chance district. Sec. 26., T. 15 N., R. 12 E., M. D. M. Elevation 4800 feet. Idle. L. C. Haines, manager, Westville.



Photo No. 20. Stewart Gravel Mine, near Gold Run. The tailings pile, from the drift workings, may be seen just back of the superintendent's house.

Stewart Mine. Dutch Flat district. Sec. 9, T. 15 N., R. 10 E., M. D. M., one mile south of Gold Run. Said to include 3000 acres lying south of the Southern Pacific railroad and 15,000 feet of channel, of

which only 2000 feet have been worked. The channel is said to be 400 feet wide and the blue cement gravel 80 feet wide. Water is obtained by the company's own ditch from Cañon Creek. Fifteen Chinamen employed. Owned by the Stewart Gravel Mining Co., Mrs. G. A. Stewart, president; J. D. Stewart, secretary, East Auburn.

Swift Shore. Michigan Bluff district. Secs. 34 and 35, T. 15 N., R. 11 E., and Secs. 2 and 3, T. 14 N., R. 11 E., M. D. M., three miles north of Michigan Bluff near the head of Volcano Cañon. Tunnel 810 feet along a gravel channel. Worked continuously for forty years. Two men working make wages. Owned by J. S. Vickford, of Michigan Bluff.

Tagpole Consolidated. Canada Hill district. Sec. 6, T. 15 N., R. 13 E., M. D. M., 6 miles east of Westville. Elevation 5500 feet. Owned by J. L. Sparhawk, of Iowa Hill.

Truro. Iowa Hill district. Secs. 21 and 22, T. 15 N., R. 10 E., M. D. M., 3 miles east of north of Iowa Hill. Elevation 1000 feet. Patented. Tunnel 350 feet. Idle. Owned by J. L. Pearson, of Iowa Hill.

Turkey Hill Consolidated. Michigan Bluff district. Includes the Boston and South Dakota and the Weske. Portion of Secs. 9, 10, 15 and 16, T. 14 N., R. 11 E., M. D. M., 2 miles north of Michigan Bluff. Patents: Weske No. 1, No. 2 and No. 3. Main tunnel over one mile. Gravel channel varies between 100' and 300' wide. Two men prospecting. Owned by the Turkey Hill Consolidated Gravel Co., Wm. Muir & Sons, principal stockholders, Michigan Bluff.

Union Mine. Iowa Hill district. Sec. 28, T. 15 N., R. 10 E., M. D. M., one mile north of Iowa Hill. Elevation 2900 feet. Cement gravel. Tunnel 1200 feet. Assessment work only. Owned by Wm. Hales and son, of Iowa Hill.

Volcano. Michigan Bluff district. Sec. 15, T. 14 N., R. 11 E., M. D. M., 1½ miles north of Michigan Bluff in Volcano Cañon. Idle. Owned by Mr. Wm. Muir, of Michigan Bluff.

Waterhouse, Big Dipper or Harmon. Iowa Hill district. Sec. 3, T. 14 N., R. 10 E., M. D. M., 2 miles southeast of Iowa Hill, in New York Cañon between Prospect and Wisconsin Hills. Patents: Big Dipper, Morning Star, Jupiter, Occidental and Weber. Water ditch from Shirttail Cañon. Tunnel 700 feet. Two men prospecting and running a tunnel. Owned by the McGeachin Mining Co., J. E. Rose, manager, Iowa Hill.

Watts Prospect. Iowa Hill district. Sec. 26, T. 15 N., R. 10 E., M. D. M., at Monona Flat, two miles northeast of Iowa Hill. Patented. An east-west gravel channel in amphibolite capped with andesite. Tunnel 3000 feet. Idle. Owned by John Watts, of Colfax.

Welcome Consolidated. Iowa Hill district. Five miles south of Colfax. Two hundred and forty acre claim. Tunnel 420 feet. Two men doing assessment work. Owned by Mr. Schwab, of Iowa Hill.

Wild Yankee. Blue Cañon district. Three and one-half miles east of Shady Run. Gravel deposit forty feet deep. Tunnel 100 feet, caved. Assessment work only. Owned by F. K. W. Develey, of Blue Cañon.

X-Ray. Canada Hill district. Ten miles east of Westville. Two miles north of Sailor Flat on the south slope of the North Fork of the American River. Three hundred and twenty acres. Two channels reported and two tunnels 300' and 600' said to have been run but not to have struck the channels. The main lower channel is said to be the same as that at the Placer Queen mine. Owned by F. Stevens, of San Francisco.

GOLD—HYDRAULIC MINES.

Since the Federal antidebris laws of 1893 went into effect, hydraulic mining in Placer County has practically ceased. The tailings from the Dutch Flat region were washed into the Bear River, where, with those



Photo No. 21. Old hydraulic workings, just northwest of Gold Run. The bedrock is rapidly being covered by a growth of pine trees, the largest of which probably date back to 1893.

from You Bet, Red Dog and other districts in Nevada County, they filled the river bed in places 10 feet to 20 feet deep. Dams have been projected by the California Debris Commission at points both north and west of Colfax, on the Bear River, to restrain tailings from these districts, but the sites have been held at such exorbitant prices by the owners that it has not been economically possible to carry out the plans. When such methods can be applied the dams can be paid for by a tax on those operating. These dams could act as storage reservoirs for

water supply, from which hydroelectric power could be generated, as well as for the gravel tailings, and would be beneficial to the country in many ways.

The gravel tailings from Gold Run, Iowa Hill, Yankee Jim's, Forest Hill, Bath, Michigan Bluff and the Ralston Divide, all found their way into the American River. Restraining dams could be built in the forks of this river, should it be permitted and receive proper financial backing.

Lost Camp. Blue Cañon district. Sec. 23, T. 16 N., R. 11 E., M. D. M., 2 miles southeast of Blue Cañon on the Southern Pacific Railroad.

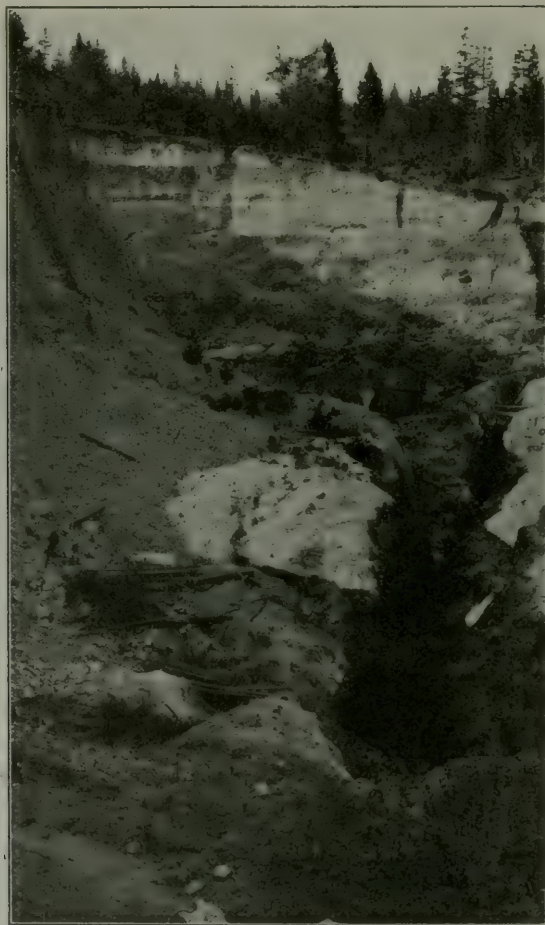


Photo No. 22. Lost Camp Placer Mine, Blue Canyon, Placer County.

An old road leads from Blue Cañon to the property. Elevation 4500'. Six hundred acres. Water is obtained from the Pacific Gas and Electric Co. for 10 cents per miner's inch. Hydraulic monitors are used under a 100 foot head. The course of the channel is East-West and it is about $\frac{3}{4}$ mile long and is $\frac{1}{4}$ mile wide at the lower end. The gravels in the main channel are about 65' deep. About 1200' of sluice boxes are used, 550' of which are in a tunnel. The grade of the boxes is 7" to every 16'. Most of the gold is caught in the upper eight boxes and some nuggets run as high as \$80.00 in value. Coarse gold is obtained from the lower gravels and fine gold from the upper. The tailings are caught by a dam, in Blue Cañon Creek, constructed of gravel held by wire fencing. Owned by Geo. F. and J. J. Miller, of Blue Cañon.

Park and Brown. Last Chance district. Sec. 21, T. 15 N., R. 13 E., M. D. M., 12 miles northeast of Last Chance near the wagon road from Westville to Last Chance over Bald Mountain. Elevation 6480'. One



Photo No. 23. Park and Brown Hydraulic Mine, four miles southeast of Canada Hill, Placer County. Duncan Peak lies in the distance to the right.

hundred and sixty acre placer claim. The deposit consists of metamorphic sandstone and shale, of red and yellow ochre colors, with a stockwork of quartz stringers up to 18" in thickness. The surface has been decomposed and the values concentrated in the upper 3' to 6'. The deposit covers an area on a side hill about 400' wide and 1500' long. Hydraulic mining has been carried on for six years and about $\frac{3}{4}$ of the surface has been worked. Water is obtainable for about six weeks in the spring by a ditch from the head of Deep Creek. A head of from 50' to 150' is used for the monitor. It is said that about \$1500 per season is cleaned up. It is possible that the bedrock could be worked on a large scale and run through a stamp mill to recover the values from the quartz stringers. Water could be piped from the head of Deep Cañon. Owned by C. McKinley, of Auburn, and A. Harveson, of Last Chance.

Pine Nut or Lincoln Consolidated. Last Chance district. Sec. 20, T. 14 N., R. 13 E., M. D. M. Nine miles northwest of Last Chance on a branch wagon road from the Bald Mountain road. Elevation 4000'. Claims: Lincoln and White Prairie. Two hundred and eighty acres. The channel, where exposed, is from 12' to 15' deep and was opened up by an 85' tunnel. Water is obtained by a $1\frac{1}{2}$ mile ditch from Spruce



Photo No. 24. Installing sluice boxes for hydraulicking at the Pine Nut Mine, Canada Hill District, Placer County.

Cañon. Equipment consists of 1200' of 11 inch pipe, 1 monitor and 60' of sluice boxes. The owners are preparing to put in a dam in a branch of Duncan Cañon. Owned by Fred C. Davidson and George Scherer, of Last Chance.

Following is a list of some of the hydraulic mines in Placer County, all idle, which could probably be operated profitably should restraining dams be constructed at a low enough cost:

Name	District	Section	Twp.	Range	Owner and address
Big Gun -----	Michigan Bluff--	22	14 N.	11 E.	J. F. Thompson, Bath, Cal.
Gold Run -----	Dutch Flat ----	4 and 9	15 N.	10 E.	Gold Run Ditch and Mining Co., J. L. Gould, Mgr., Alameda, Cal.
Little Bear River----	Dutch Flat ----	34 and 35	16 N.	10 E.	Wm. Nicholls, Jr., Berkeley.
Polar Star -----	Dutch Flat ----	34 and 35	16 N.	10 E.	Wm. Nicholls, Jr., Berkeley.
Pond -----	Forest Hill ----	3 and 4	13 N.	10 E.	G. L. Duffy, Michigan Bluff.
Southern Cross -----	Dutch Flat ----	34 and 35	16 N.	10 E.	Wm. Nicholls, Jr., Berkeley.

GOLD—PLACER MINES.

(Surficial or Sluicing.)

Considerable placer mining is carried on along the rivers in Placer County by parties of from one to three men. Some of these miners work on claims owned by old settlers and pay a royalty, while others work independently and prospect wherever the gravels pan favorably. Workmen with rockers and longtoms recover on an average of \$2.00 per day in gold per man. Occasionally a rich streak of gravel or pocket is found.

Acacia Claim. Damascus district. Sec. 14, T. 15 N., R. 11 E., M. D. M. Idle since 1906. Reported to be leased to Oakland parties. Owned by George McAuley, of Auburn.

Bibl.: Colfax Record, Oct. 8, 1915.

Bear River Claim. Dutch Flat district. Sec. 4, T. 15 N., R. 10 E., M. D. M., $1\frac{1}{2}$ miles southwest of Dutch Flat. Elevation 2500 feet. Reported to have 5000 feet along the bed of the Bear River. Idle. Owned by E. C. Uren, of Nevada City.

Bear River Extension. Colfax district. Sec. 14, T. 15 N., R. 9 E., M. D. M., $3\frac{1}{2}$ miles north of Colfax. Elevation 2000 feet. Patented $\frac{1}{2}$ mile along the Bear River. Worked in 1902 with an hydraulic elevator. Idle. Owned by E. R. Waring, formerly of Colfax.

Bear River Tunnel Co. Colfax district. Sec. 6, T. 15 N., R. 9 E., and Secs. 5, 6 and 7, of T. 15 N., R. 10 E., M. D. M. Elevation 2200

feet. Patented. Five miles along the bed of Bear River. In 1902 the tailings were concentrated. Idle. Owned by E. C. Uren, of Nevada City.

Bogus Thunder. Michigan Bluff district. Sec. 19, T. 14 N., R. 12 E., M. D. M., six miles east of Michigan Bluff by trail. Two hundred and fifty acres in claims. Loose gravel bars along the North Fork of the Middle Fork of the American River. Owned by S. S. Caples, of Michigan Bluff. Leased by B. E. Caples and W. S. Tripp, of Michigan Bluff.

Booth River Claim. Iowa Hill district. Sec. 29, T. 15 N., R. 10 E., M. D. M., $1\frac{1}{2}$ miles northwest of Iowa Hill. Elevation 1300 feet. Three claims in bed of North Fork of American River. Gravels are sluiced. The two Booth brothers work together on the claim. The gravels are said to be mostly old hydraulic tailings, and that about \$120.00 in gold per month is recovered, except occasionally when rich finds are made. It was reported that in about two and one-half months of the fall of 1915 over \$2900 was taken out. Owned by John Booth, of Iowa Hill.

Cambridge. Iowa Hill district. Secs. 9, 16, 17, 19 and 20, T. 14 N., R. 10 E., M. D. M., 4 miles south of Iowa Hill. Patented. Four miles of tailings in the bed of Shirttail Cañon. The gravels were sluiced in 1902. Idle. Owned by Mrs. Stemple, of Colfax.

Cañon Creek Tailings. Dutch Flat district. Sec. 10, T. 15 N., R. 10 E., M. D. M., $1\frac{1}{2}$ miles northeast of Gold Run. Elevation 1310 feet. Ten acres. One and one-half miles along Cañon Creek. Idle. Owned by the Stewart Gravel Mines, Inc., of East Auburn.

Collins. Colfax district. Sec. 31, T. 15 N., R. 10 E., M. D. M. Reported to have 7000 feet of gravel tailings along North Fork of the American River below the Booth claims, extending up the river from $\frac{1}{2}$ mile above the Forest Hill bridge. Three claims called the Boston, Annis and Keystone. Leased to Petit Bros. and Mr. Brown, of Colfax. Gold is recovered by sluicing old tailings along the river. About \$3.00 per day in gold per man is reported to be recovered. Owned by W. B. Fowler, of Colfax.

Gillett. Colfax district. Sec. 31, T. 15 N., R. 10 E., M. D. M. Twelve acres along the bed of the North Fork of the American River. Sluicing during dry season. Owned by F. N. Gillett, of Colfax.

Haney Consolidated. Last Chance district. Sec. 4, T. 14 N., R. 13 E., and Sec. 33, T. 15 N., R. 13 E., M. D. M. East of the Blue Eyes drift mine, on the northwest side of Duncan Cañon. Reported to hold one mile along Bloody Ravine, the bottom of which was cleaned up in



Photo No. 25. Gravels in the American River just below (west of) Rattlesnake bridge. Old hydraulic tailings may be seen on the terrace to the right. Considerable of the gravel in the river has come from the hydraulic mines above. Property of M. A. Kelley, of Auburn.

1854. It is thought by the owner that some gold can still be obtained from the flats and sides of the ravine. Owned by Thos. F. Haney, of Last Chance.

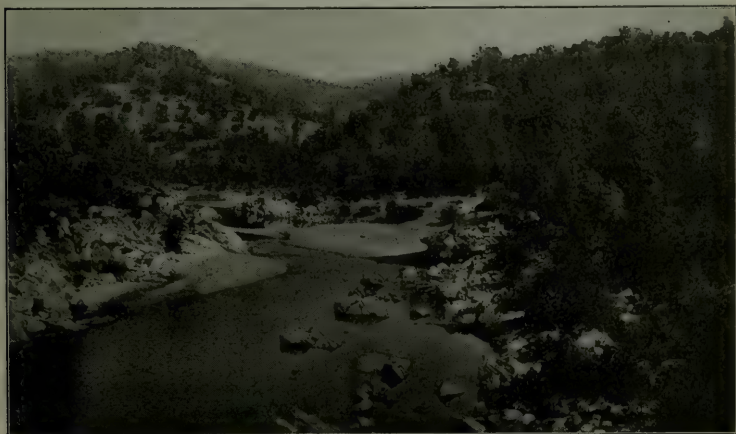


Photo No. 26. Gravel bars along the American River, just above (east of) Rattlesnake bridge. Old hydraulic tailings are said to cover virgin auriferous gravels in these bars which could be worked to advantage by hydraulic elevators. The hard, rugged, granitic bedrock would probably make dredging unfeasible.

Horseshoe Bar. Michigan Bluff district. Two miles southwest of Michigan Bluff. No mining now carried on. Used only for a power plant, which supplies the Excelsior drift mine.

Kelly. Auburn district. Sec. 9, T. 11 N., R. 8 E., M. D. M. Gravel bars for one mile along the American River north of Rattlesnake Bar. Owned by M. A. Kelly, of Auburn. These gravels have recently been prospected and pan well in gold.

Kinder River. Iowa Hill district. Sec. 28, T. 15 N., R. 10 E., M. D. M. One mile north of Iowa Hill. Claim along the north fork of the American River, adjoining the Booth claim. Two men sluicing on a small scale. Owned by Mr. Schworb, of Iowa Hill.

Lehigh. Michigan Bluff district. Sec. 30, T. 14 N., R. 11 E., M. D. M. Sluicing was carried on but the gravels are practically worked out. Owned by J. F. Thompson, of Bath.

Martin. Iowa Hill district. Sec. 31, T. 15 N., R. 10 E., M. D. M., 2 miles west of Iowa Hill, along the bed of the North Fork of the American River. Twenty acres. Some sluicing was carried on in the gravel tailings. Idle. Owned by F. P. Gallaher, of Colfax.



Photo No. 27. Sluicing bench gravels on the south side of the North Fork of the American River, one-half mile below the Iowa Hill bridge, east of Colfax. A small gas engine is used to pump water from the river into the sluice boxes.

Pine Avenue. Four miles west of Iowa Hill on the North Fork of the American River. Near the Booth claim. Assessment work only.

Pleasant Bar. Michigan Bluff district. Sec. 33, T. 14 N., R. 11 E., M. D. M., $2\frac{1}{2}$ miles southwest of Michigan Bluff. Was worked with a hydraulic elevator and sluices. Assessment work only. Owned by E. Kavanaugh, No. 40 J st., Sacramento.

Potato Flatiron. Damascus district, near Red Point. Four men said to be working. Owned by Oakland and Alameda parties. Leased by Jack Creighton, manager, of Damascus.

Rocky Bar or Estey. Colfax district. Sec. 1, T. 14 N., R. 9 E., M. D. M., 3 miles east of Colfax and $\frac{1}{4}$ mile below the Iowa Hill bridge on the North Fork of the American River. The property is reached by a trail along the south side of the American River from the Iowa Hill road. Elevation 1050'. Claims "Swastika," "First Chance," "Rocky Bar," "Rocky Bar Extension." The claims include bench gravels along the river which are shoveled into sluice boxes and washed with water pumped from the river by a small gasoline engine. A diving suit is worn by the owner who recovers gold from the deep pools in the bed of the river. Owned by O. L. Estey of Colfax.

Various attempts have been made to recover gold from the American River bed and from the Feather River bed in Butte County. Coarse gold has been recovered from the bedrock in rough places where a dredge could not be operated and where the river channel could not be diverted without unwarranted expense. The use of divers' suits is an ambitious attempt to recover gold, but the difficulty and slowness of working under water must necessarily make the work expensive and in many cases prohibitive to financial success. The method will probably never become of great economic importance.



Photo No. 28. Diving outfit used for the recovery of gold from the deep pools in the bed of the North Fork of the American River, east of Colfax.

San Francisco. Iowa Hill district. Sec. 4, T. 14 N., R. 10 E., M. D. M., claim one mile southeast of Iowa Hill, adjoins the Harman, or Big Dipper, claim. Worked by the owner, S. Delmu, of Iowa Hill.

Swamp Angel Mine. Dutch Flat district. Secs. 7 and 18 of T. 16 N., R. 11 E. Four miles north of Towles at Lowell Hill. Worked when water is available. Owned by A. W. Hawkins of San Luis Obispo.

Theniss and Adams. Colfax district. Sec. 1, T. 14 N., R. 9 E., M. D. M. Gravel bars on the west side of the North Fork of the American River, just above the bridge on the stage road from Colfax to Iowa Hill. Elevation 1200 feet. The gravel is loose and about 6 feet deep. The gravel is not worked to bedrock and is washed in a hand rocker. The fine gold is caught on an old carpet, while the finest probably escapes. Two men save about \$16.00 in gold per week. Worked by Martin Theniss and F. C. Adams, of Colfax.

Zelma Bell. Colfax district. Sec. 19, T. 14 N., R. 10 E., M. D. M. Along the bed of the North Fork of the American River, north of the mouth of Shirttail Cañon. Forty acres. Owned by the Zelma Bell Mining Co. Assessment work only.

GOLD—DREDGES.

Dredging is being carried on along the Middle Fork of the American River and along Auburn Ravine. In 1915 three dredgers produced \$93,812 in gold. Large deposits of gravel in the Bear River await a feasible means for working them. The nature of the bedrock is such that they might be dredged.

El Dorado and Placer Gold Mining and Power Co. Butcher Ranch district. Sec. 35, T. 13 N., R. 9 E., M. D. M., $1\frac{1}{2}$ miles south of Butcher Ranch, near Poverty Bar. About $3\frac{1}{2}$ miles up the Middle Fork of the American River from the Pacific or Yukon dredge. The gravel bars are partially covered by hydraulic tailings and average about 25 feet in depth. The dredger hull is 45' x 85', and carries a line of 79 buckets of $3\frac{1}{2}$ cu. ft. capacity each. It is capable of dredging 35 feet below the water line. Five electric motors have an aggregate of 220 h. p. and receive their current from an extension from the line of the Pacific dredger. Three shifts of four men each operate the dredger. Owned by the El Dorado Gold Mining and Power Company, W. B. Pennycook, J. J. Madigan, W. D. Sullivan and Chas. Malin, all of Vallejo, are financially interested.

Gardella Gold Dredge Co. Gold Hill district. Sec. 8, T. 12 N., R. 7 E., M. D. M., $\frac{1}{2}$ mile northwest of Virginia and north of the road from Lincoln to Newcastle. Elevation 350 feet.

The gravels being worked were partially drifted in the early days by the Chinese and are comparatively fine and angular, there being no coarse boulders, such as are found in the main stream channels. The deposits average about sixteen feet in depth, the upper portion being clay. The pay gravel varies from 1' to 8' in thickness and lies on a

granitic bedrock. The channel is about 900 feet wide, and about 6 years work for one dredge has been outlined. A 160-foot front is worked and about 75,000 cubic yards of gravel are handled each month. The gravel is said to average about $12\frac{1}{2}\phi$ per cubic yard, the cost of working being about 7ϕ per cubic yard. The land is low and is sometimes partially covered by overflow from Auburn Ravine during the rainy season. Three shifts of men, of three men each, including dredge-masters, are employed on the dredger, while three men are employed most of the time cutting trees and brush. The sale of oak wood from the trees probably pays for the cost of clearing. The dredge was built by the Risdon Iron Works and has 62 5-cubic-foot, close-connected



Photo No. 29. Gardella Dredge, near Virginia, four miles northeast of Lincoln, working gravel and alluvial deposits north of Auburn ravine.

buckets. The boat is 40' x 90'. Electricity is obtained by tapping the main Pacific Gas and Electric Company's line from Drumm, at Ophir. The motors on the dredge develop about 500 h. p.

The company owns portions of the Peterson, Conley and Chevalier ranches, including 105 acres, besides having options on other property. Owned by the New Castle Gold Mining Company, Lawrence Gardella, of Oroville, manager.

The **Gaylord** gold dredge which was working on the American River, below Rattlesnake Bar near Loomis, was reported closed down in November, 1915. The ground was worked out. The dredge was a small one with 3-cubic-foot buckets, and six men were employed.

Oroville Dredging Company. Dairy Farm district. Sec. 31, T. 14 N., R. 7 E., M. D. M., 5 miles northeast of Sheridan and one-half mile

south of the Bear River. Elevation 954 feet. Two Risdon dredgers were operated several years ago, but have been removed. Owned by W. P. Hammon, of Oroville.

Pacific Gold Dredging Company, subsidiary of the Yukon Gold Dredging Company. Butcher Ranch district. Sec. 5, T. 12 N., R. 9 E., M. D. M. On the Middle Fork of the American River near Mammoth Bar. The dredger is of the Bucyrus type and is equipped with a line of 77 $7\frac{1}{2}$ -cubic-foot buckets, and a shaker screen made of one-inch cast manganese steel. About 4500 cubic yards of gravel are handled daily. The gravel averages 28 feet deep and consists of loose gravel with

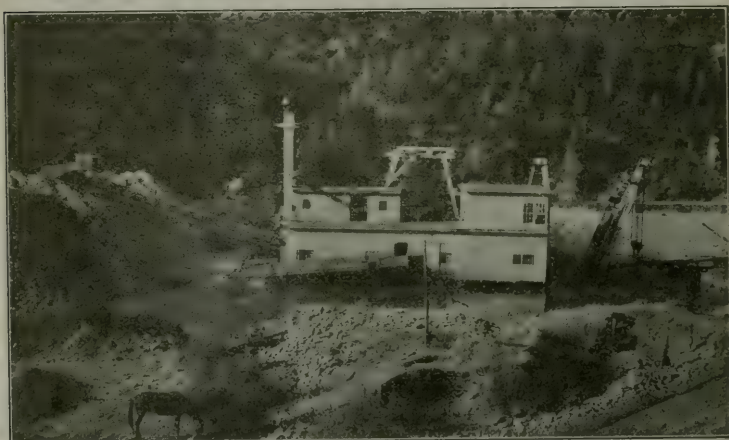


Photo No. 30. Bucyrus Dredger of the Pacific Gold Dredging Co., working near Mammoth Bar on the Middle Fork of the American River.

boulders. The bedrock is slate, which is decomposed in places one foot deep. The gravel probably averages considerably over 10¢ per yard, while the bedrock probably averages over \$1.00 per yard. Owned by the Pacific Gold Dredging Company, S. R. Guggenheim, president, 417 Hobart Bldg., San Francisco; Chas. K. Lipman, secretary; H. C. Perring, superintendent, Auburn and Oroville. C. A. Anderson, dredgemaster.

GRANITE.

The quarries in the granodiorite east of Rocklin are the only ones producing granite in the county. The quarries northeast of Rocklin in the region of Loomis and Penryn are all idle. The granodiorite at Rocklin is light-colored and fine-grained and composed principally of quartz and feldspar, with fine crystals of hornblende and scales of biotite. The rock quarried at Penryn is coarse-grained and composed

principally of quartz and feldspar, with quite large crystals of hornblende and flakes of biotite.

Alexson, Gabriel and Company. Formerly the Placer Granite Company. Rocklin district. Worked by G. Alexson and son and son-in-law. Owned by Gabriel Alexson, of Rockland.

Anderson Quarry. Rocklin district. Worked by O. Anderson and three sons and son-in-law. Owned by Oscar Anderson, of Rocklin.

Andrews-Quinn Quarry. Rocklin district. Owned and worked by Oscar Andrews, of Rocklin.

California Granite Company. Rocklin district. Sec. 19, T. 11 N., R. 7 E., M. D. M. Eight acres owned, which includes the old Mantyla



Photo No. 31. California Granite Quarry at Rocklin, Placer County, looking north.

quarry. The company also leases the old Waters quarry. Equipped with a steam hoist, electric compressor and three derricks. Air hammer drills and wedges are used for splitting the blocks. Two saws are in use; one a revolving wheel 7 feet in diameter, with teeth set at an angle of 26° , which will cut 48 inches to a depth of 30 inches in 46 minutes; and a California Granite Cutter consisting of steel plates $\frac{1}{4}$ inch thick, set as teeth along a horizontally moving frame. Steel shot are fed to the cutting edges of both of these saws. From 50 to 100 men are usually employed. Owned by the California Granite Company, Adolph Pernu, president; A. Bocci, 518 Sharon Bldg., San Francisco, secretary; John Hall, superintendent, Rocklin. The same company is also operating a granite quarry near Porterville, Tulare County.

Delano Granite Company. Rocklin district. Sec. 20, T. 11 N., R. 7 E., M. D. M., 80 acres leased for quarry purposes. Steam hoist, 2 derricks, air compressor and hammer drills. Produce about 15,000 cubic feet of stone yearly. Costs about 50¢ per cubic foot to quarry and load on the cars. Sold for 75¢ per cubic foot laid on the cars at Rocklin. The stone is sold chiefly for building and monumental purposes. Owned by the Delano Granite Company, Inc., L. E. Delano, president; I. T. Delano, secretary, Rocklin.



Photo No. 32. Delano Quarry, east of Rocklin, Placer County, looking southward.

Escola, Kaivola and Tuperinan. Rocklin district. Sec. 30, T. 11 N., R. 7 E., M. D. M. Quarry southeast of Rocklin, with derrick. Sell curbstone and rip-rap. The three owners do their own work.

Griffith's Quarry. Penryn. Sec. 35, T. 12 N., R. 7 E., M. D. M. Coarse grained granodiorite. Quarry idle. One man works occasionally getting out tombstones from granite already quarried. Owned by David Griffith, of Penryn.

Hebrick Quarry. Rocklin district. Sec. 30, T. 11 N., R. 7 E., M. D. M. Small quarry being worked by L. Hebrick and two brothers and father. Leased by Louis Hebrick from his father.

Hendrickson Quarry. Rocklin district. Sec. 30, T. 11 N., R. 7 E., M. D. M. Small granodiorite quarry being worked for curbstone by the two Hendrickson brothers, a cousin and a son-in-law. Owned by Hendrickson Bros. and Company.

Huhtala and Kanasto Quarry. Rocklin district. Mr. Huhtala and two sons and Mr. Kanasto work a quarry on rented ground. Equipment consists of a steam hoist.

Oscar Kesti Quarry. Rocklin district. Sec. 19, T. 11 N., R. 7 E., M. D. M. Owned by Oscar Kesti who, with his son and one hired man, gets out curbstone and rip-rap.

Kesti Quarry. Rocklin district. Sec. 30, T. 11 N., R. 7 E., M. D. M. Messrs. Sam and Otto Kesti work a rented quarry. Sam Kesti also owns a quarry in the same section which he with two helpers works for curbstone and paving blocks.

Leed Quarry. Rocklin district. Werner Leed produces some curb-ing and rubble.

Liikola Quarry. Rocklin district. Ed Liikola rents a quarry and sometimes employs one man.

Maki Quarry. Rocklin district. Jacob Maki rents a quarry and takes out curbstone, paving bricks and rip-rap.

Pacific Granite Company. Rocklin district. Sec. 29, T. 11 N., R. 7 E., M. D. M. Elevation 204 feet. One mile southeast of Rocklin.



Photo No. 33. Pacific Granite Quarry, one mile southeast of Rocklin, Placer County.

Spur track to quarry. Own the old Copp quarry and rent the Werner Leed quarry. Equipped with steam hoist and electrically operated compressor. Hammer drills are used, with 100 lbs. air pressure, and about one foot per minute can be drilled. A specialty is made of mausoleums and building stone. About 35¢ per ton is received for rip-rap. From 6 to 8 men, all of whom are interested in the company, do their own work. Carl Ranta, president, Rocklin; Wm. Maki, secretary, Rocklin.

Pisila and Aho Quarry. Rocklin district. Sec. 30, T. 11 N., R. 7 E., M. D. M. Equipped with steam hoist. Rented and worked by Messrs. Pisila and Aho, of Rocklin.

Union Granite Company. Rocklin district. Sec. 30, T. 11 N., R. 7 E., M. D. M., $\frac{1}{2}$ mile spur track from Rocklin. Four acres leased at 25¢ per ton royalty. Equipped with one steam hoist. Hand drills are used. Street curb and monumental stone are sold at 49¢ and 70¢ per cubic foot, respectively, at the quarry. Mat Ruhkala, manager, Rocklin.

Wickman Quarry. Rocklin district. Sec. 30, T. 11 N., R. 7 E., M. D. M. Owned by Oscar Wickman, who works the quarry aided by his two sons and two hired men.

Idle Quarries are as follows:

Adams and Waldo, Rocklin.

Brady and Began, Rocklin.

Carlaw Bros., Loomis.

Dunns Quarry, Rocklin.

Hoyt's Quarry, Rocklin.

Hytiman's Quarry, Rocklin.

Janiala Jacob Quarry, Rocklin.

Kakkinan, Rocklin.

Marks Quarry, Rocklin.

Perno Quarry, Rocklin.

Roberts Quarry, Penryn.

IRON.

A considerable deposit of magnetic iron ore occurs along the contact of the Calaveras slates with granodiorite near Hotaling, 5 miles northwest of Clipper Gap. Lack of a cheap fuel has prevented further development, but with electric power near-by the property should be valuable. Over 15,000 tons of pig iron were produced in 1883 by the California Iron and Steel Company, later the Phoenix Iron and Lime Company. Several thousand tons of hematite ore are reported to be on the dump and the remains of the old smelting furnace and buildings are still to be seen.

Bibl.: Rept. IV, pp. 237-239, 1884; Bull. 38, pp. 298-9, 1906.

LIMESTONE.

Lenses of limestone occur commonly associated with the metamorphic rocks throughout the county, but are seldom of large enough extent, or, if so, near enough to transportation, to be economically valuable. A lens of considerable size is cut by the Middle Fork of the American River, 5 miles northeast of Auburn and is being worked on the El

Dorado side of the river by the Pacific Portland Cement Co. The portion of the deposit in Placer County will no doubt be worked in time. Small deposits northward in the same belt occur two or three miles south of Clipper Gap. A lens one mile north of Hayden Hill, three miles southeast of Towle, cut by the North Fork of the American River, is about two miles from the railroad, but no development work has been done.

The **Holmes Lime Company** owns a lime quarry near Newcastle but it has been idle the past few years. H. W. Postlewaite, president, 380 Monadnock Building, San Francisco.

The **Spreckels Sugar Company** is reported to have purchased the Mason property near Applegate in Secs. 8 and 9, of T. 13 N., R. 9 E., M. D. M. The company is reported to have secured the property for a limestone deposit which is suitable for sugar refining. The rock will be shipped to company's refineries on San Francisco bay.

MAGNESITE.

Magnesite deposits have been located in the serpentine area 5 miles northeast of Iowa Hill, in Cañon Creek, $\frac{1}{4}$ mile south of Towle, and on the south slope of Bear River, $2\frac{1}{2}$ miles north of Towle. The magnesite occurs as stockwerk in the serpentine, with an occasional widening of the veins.

The **Placer County Properties Company**, formerly the Sprague-Keasby Asbestos and Magnesia Co., holds 400 acres in claims in Sec. 13,



Photo No. 34. Outcrop of magnesite on the Snowball Claim, 5 miles northeast of Iowa Hill.

of T. 15 N., R. 10 E., and Secs. 7 and 18, of T. 15 N., R. 11 E., M. D. M., about five miles northeast of Iowa Hill. The topography to the north, on the slope towards Giant Gap is very steep, but that of the Snowball

(160 A.) claim is more gentle. There is an abundance of timber and water on the latter claim.

Three outcrops of magnesite, about the size of that on the Snowball claim (see Photo No. 34), occur on the south slope of the North Fork of the American River. A tunnel, originally driven into the serpentine bedrock in search of gold bearing gravels, cuts through a stockwerk of magnesite veins, varying from threads up to eight inches wide. Not enough magnesite is exposed in this tunnel to pay for mining it, but it proves the continuity of the veins with depth. The tunnel is driven at a considerable distance east of the main magnesite outcrops, so it does not reveal their size, with depth.

The property has not yet been sufficiently developed to either prove or disprove its value. It could be developed on a small scale and the product calcined on the property at comparatively small cost. This would be the more feasible plan, since the product would have to be hauled 30 miles by way of Forest Hill to Colfax. Whether the proceeds from the product would pay for the development work is questionable, but such a plan might partially defray expenses while at the same time it would determine the value of the property. Owned by the Placer County Properties Co., S. M. Sprague, president, East Auburn; Mrs. Gertrude Shelley, secretary, 326 Ochsner Bldg., Sacramento.

Bibl.: U. S. Geol. Surv. Bull. 540, pp. 501-503, 1913. Min. Res. of the U. S., 1914, Pt. II, p. 579.

Towle Magnesite deposits. Outcrops of magnesite in the region of Towle occur in brecciated serpentine. An outcrop is reported in the bed of Cañon Creek, in Sec. 6, T. 15 N., R. 11 E., M. D. M., about $\frac{1}{4}$ mile south of Towle station; another in Sec. 24, T. 16 N., R. 10 E., about $2\frac{1}{2}$ miles north of Towle on the south side of Bear River; and a third in Sec. 36, T. 16 N., R. 10 E. No development work has been done on any of the deposits to determine their commercial value.

Owned by J. H. Johnson, of East Auburn, and J. D. Sullivan, of Towle.

Bibl.: Min. Res. of the U. S., 1914, Pt. II, p. 579.

MINERAL PAINT.

Ochre has been reported on the Chamberlain-Keena-Shepard property, near Gold Run. The deposit is probably of little importance.

MINERAL WATER.

The following mineral spring descriptions by Gerald A. Waring are largely taken from U. S. Geological Survey, Water Supply Paper No. 338; with additional information included by the writer.

“Brockway Hot Springs. The only noteworthy thermal springs in the basin of Lake Tahoe are at the north end of the lake, near Stateline Point, at a fishing and boating resort, known as Brockway, where in 1909 a hotel and four cottages provided accommodations for 100 people. The springs rise in the lake, within a few feet of the shore, bubbling up from numerous vents principally at two localities. One of these localities is at the boat pier, where one spring has been cemented so as to form a drinking basin near the lake edge.” A temperature of



Photo No. 35. Brockway Hot Springs and bathing pool on the northern shore of Lake Tahoe, Placer County.

120° F. was recorded in this spring, and the discharge was about 3 gallons a minute when visited in September, 1916. A spring behind the bar had a temperature of 140° F. A warm swimming pool has been constructed by placing a concrete wall around the springs in the lake and an 18 room bath house built. The temperature of the bathing pool is 66° F. Water from another group of springs, which is situated in the lake near its edge, about 150 yards northwestward, is pumped to a tank nearby and used for bathing and for laundry purposes. The temperature of this spring in September, 1916, was 130° F. The water is faintly sulphureted, but seems to be only slightly mineralized otherwise, for it is very soft and excellent for laundry use.

"The springs rise from granodiorite which is overlain on the slopes above by andesitic lava. A probable fault has been mapped by Lindgren⁷ as passing southeastward through the lake, about one-third of a mile west of the springs.⁸ The fault appears to furnish the most plausible explanation for the existence of the springs."

Owned by M. Lawrence and H. O. Comstock, Brockway Hot Springs, Cal.

"Cisco Iron Spring. A cold spring that yields perhaps 8 gallons a minute is situated in a small depression in a group of alders on a gentle slope on the southern side of the cañon of South Fork of Yuba River, half a mile north of Cisco railroad station and 100 yards south of the wagon road. The soil is deeply iron stained for a number of yards along the overflow channel. The spring is well known locally, as it furnishes excellent cold drinking water. The surrounding rocks are the slates, and schists derived from them, that have been mentioned in speaking of the sulphur springs near South Fork of Yuba River a mile or two upstream from the iron spring."

When visited in September, 1916, the temperature of this spring was 44° F. and flowed 2 gal. per min. Iron was being deposited along the overflow.

"Deer Park Springs. In the cañon of Bear Creek, 8 miles in a direct line southeast of Summit Soda Springs, four small springs form drinking pools of cool, mildly carbonated water that deposits considerable iron. They were formerly known as Scott Springs but are now known as Deer Park Springs. The place has been conducted as a resort since the eighties. In 1909 a hotel, a dining hall, and seven cottages provided accommodations for 150 guests. The buildings are situated in a little flat on the northwestern side of Bear Creek, and the springs are on a hillside 150 to 200 yards eastward, across the stream. Small rustic houses have been erected over the springs, two of which are beneath one roof. Two of them are known as Soda Springs, one as the Sulphur Spring and one as the Iron Spring. Their waters have the distinctive tastes indicated by these designations and differ somewhat though not markedly in composition, as is shown by the following analyses of three of them; all are secondary-alkaline, primary-saline waters."

⁷Lindgren, Waldemar, Geol. Atlas, Truckee folio (No. 39), U. S. Geol. Survey, 1897.

⁸This fault is not shown on Map No. 1 of the atlas accompanying the report of the California State Earthquake Commission, probably through oversight.

Analyses of water from Deer Park Springs, Placer County, Cal.

(Analyst, G. E. Colby (1909). Authority, owner. Constituents are in parts per million.)

	Soda No. 1	Soda No. 2	Sulphur
Properties of reaction—			
Primary salinity	33	19	31
Secondary salinity	0	0	0
Per-salinity	0	0	0
Primary alkalinity	13	13	13
Secondary alkalinity	54	68	56
Subalkalinity	17	7	17

Constituents	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values
Calcium (Ca)	160	7.99	205	10.29	114	5.69
Magnesium (Mg)	174	3.62	84	1.75	111	2.31
Sulphate (SO ₄)	45	1.27	39	1.09	32	.89
Chloride (Cl)	297	9.90	367	12.23	210	6.99
Carbonate (CO ₃)	76	2.52	31	1.03	53	1.76
Silica (SiO ₂)						
Total solids	990		900		670	
Carbon dioxide (CO ₂)	Present	Present	Present	Present	Present	Present
Hydrogen sulphide (H ₂ S)					Present	Present

“The springs rise in an area of granitic rock that is probably an eastward extension of the material that forms the mountains to the west. At the springs this rock is decomposed to gravel and to kaolin-like clay. It is nearly surrounded by andesitic lava, which covers the slopes less than 100 yards east of the springs.”

“**Florence Spring.** A quarter of a mile northeast of Summit Soda Springs, on the northern side of the stream, there is a carbonated spring that is locally called Florence Spring. It has a considerably larger flow than the springs of the Summit group, and it is not so strongly carbonated, but it probably contains more iron, for the water tastes of iron and deposits much iron along its overflow channel. The spring has not been improved, but it has been used to some extent for drinking.”

“**Heath Soda Springs.** Five miles in a direct line westward from the Summit Springs in the canyon of North Fork of American River, on its northern side, are the carbonated springs known as Heath Soda Springs. They yield considerably more water than the Summit Springs but are not so strongly carbonated. They have not been improved, and as the place is not easily accessible it is rarely visited. The springs issue in an area of granitic rock, within a quarter of a mile of the western border of an area of altered slates; andesitic lava covers the slopes 2 miles northward and westward.” Owned by the North Fork Association.

"Iron Springs near Lake Tahoe. A mile northwest of McKinney, on the western side of Lake Tahoe, two small iron springs rise in the woods on a gentle slope about 350 yards above the main wagon road and form pools about a foot in diameter and a foot in depth, four yards apart, which are used for drinking. The water tastes distinctly ferruginous and has deeply iron stained the soil for about 75 yards below the springs. The staining is probably caused by the fact that the water contains a small amount of carbon-dioxide, which holds the iron in solution until this gas has escaped, when the iron is precipitated and deposited along the overflow course."

"The springs issue from lake deposits of sand and gravel near the base of steep slopes of andesitic lava."

When visited in September, 1916, the lower spring flowed $\frac{1}{3}$ gal. per min. and had a temperature of 49° F.

Analysis of Water from Lake Tahoe, Cal.

(Analyst F. W. Clarke. U. S. Geol. Survey Bull. 330, p. 122.)

Constituents	1	
	By weight	Reacting values
Sodium (Na)	7.4	.32
Potassium (K)	3.3	.08
Calcium (Ca)	9.4	.47
Magnesium (Mg)	3.0	.24
Sulphate (SO ₄)	5.5	.11
Chloride (Cl)	2.3	.07
Bromide (Br)		
Carbonate (CO ₃)	28	.93
Silica (SiO ₂)	14	.46
Total	72.9	

McGlashan Mineral Spring is located on the Truckee River, 9 miles south of Truckee. The water is strongly carbonated, carries iron, and arises in decomposed granite and boulders. A small bottling plant is operated by J. G. Kirchner, leaser.

"Powderhorn Creek Carbonated Spring. A small, cool, carbonated spring lies near the mouth of Powderhorn Creek, $5\frac{1}{2}$ miles in a direct line southwest of Deer Park Springs, but it is unimproved and is known mainly to hunters and fishermen. Small carbonated springs of similar character probably issue at other places in this region, but they are of little note and are known chiefly to the local sportsmen."

"Salt Springs on North Fork of American River. On the western bank of North Fork of American River, about 2 miles east of Colfax, there are a few saline and alkaline seepages that are known to local hunters as salt licks, or deer licks. Springs that yield perhaps 10 gallons a minute issue 25 or 30 feet above the river from a bank at the

cañonside. There is said to be a considerable saline deposit along their courses in summer, but when the locality was visited the small deposit that was seen consisted mainly of soda and alum. The surrounding rock is slate of Carboniferous age, which has been described by Lindgren.⁹ The saline material is apparently derived from these old sediments.”

“**Sereno Creek Carbonated Spring.** About $3\frac{1}{2}$ miles south of Soda Springs station, a short distance east of the road, is a small spring that forms a drinking pool. It is on the eastern side of the cañon of Sereno Creek, near the base of steep slopes of andesite that overlies rhyolitic lava.”

“**Sulphur Spring on Middle Fork of American River.** A small spring of strongly sulphureted water is situated in the cañon of Middle Fork of American River, about 20 miles west of Tahoe. The water issues at the base of a bluff of morainal material, on the southeast side of the stream. It has been visited by fishermen and others who penetrate this portion of the Sierra, but it is not well known.”

“**Summit Soda Springs.** A number of groups of small carbonated springs lie in the Sierra west of Lake Tahoe. One of the northernmost of these groups has long been known as Summit Soda Springs, although the springs are about 13 miles by road south of Summit station, on the Southern Pacific Co’s railroad. The springs are situated in a little flat beside North Fork of American River, and in the late eighties or early nineties a hotel was built, and the place was conducted as a resort for several years. The hotel burned in 1898, however, and since then the property has not been open to the public.”

When visited in September, 1916, the owner, Mr. Joseph W. Stanford of Warm Springs, Alameda Co., had built a private stone mansion and caretakers’ quarters on the property. Only two springs were being used.

“Four cool, carbonated springs rise in the flat on the south side of the North Fork, and a fifth rises at the edge of the stream. Three of them have been enclosed by spring houses and are used as drinking springs. All have small flows, but they are strongly carbonated and deposit noticeable amounts of iron. The following analyses of one of the principal springs show the water to be moderately alkaline and saline.

⁹Lindgren, Waldemar, U. S. Geol. Survey Geol. Atlas, Colfax folio (No. 66), pp. 1-2, 1900.

Analyses of Water from Main Spring, Summit Soda Springs, Placer County, Cal.

(Constituents are in parts per million.)

	1	2
Properties of reaction:		
Primary salinity	34	36
Secondary salinity	0	0
Tertiary salinity	0	0
Primary alkalinity	13	14
Secondary alkalinity	53	50
Tertiary alkalinity	328	339

Constituents	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	238	10.34	248	10.76
Potassium (K)	8	.20	Trace	Trace
Calcium (Ca)	210	10.48	183	9.14
Magnesium (Mg)	20	1.64	21	1.73
Iron (Fe)	22	.79	23	.82
Aluminum (Al)	10	1.11	16	1.77
Chloride (Cl)	272	7.69	272	7.69
Carbonate (CO ₃)	201	15.76	-----	13.91
Metaborate (BO ₃)	Trace	Trace	-----	-----
Silica (SiO ₂)	33	1.09	35	1.16
Totals	1,014	-----	941	-----
Carbon dioxide (CO ₂)	1,593	72.41	1,586	72.09

1. Analyst and authority, Winslow Anderson (1888).

2. Analyst, J. F. Rudolph (1878). Authority, U. S. Geol. Survey Bull. 32.

"On the hillside 200 to 500 yards southward, there are four other carbonated springs which have been developed only to the extent of excavating small basins about them."

"The main springs issue in an area of granitic rock, the minor ones, on the hillside to the southeast, issue from schists that are a result of contact metamorphism between the granitic rock and slates. A mile southward the slopes are covered with andesitic lava, and Tinker Knob, 3 miles to the east, is a volcanic mountain.¹⁰"

"Near the road, 2 miles westward, downstream from the Summit Springs, there are considerable deposits of lime carbonate, and small quantities of carbonated water still seep at a few points in them. North of the railroad, on the wagon road to Truckee, there are also carbonate deposits that are the work of mineral springs."

"**Sulphur Springs near South Fork of Yuba River.** In the cañon of South Fork of Yuba River, less than a mile north of Cisco railroad station, are two small springs, one of which forms a drinking spring near the wagon road on the southern side of the river. The other is some distance farther upstream, on the northern side of the river, and

¹⁰A detailed description of the geology of this region is given by Waldemar Lindgren, U. S. Geol. Survey, Geol. Atlas, Truckee folio (No. 39), p. 5, 1897.

has been little used. Their waters are only faintly sulphureted. The rocks of the locality consist of slates, in part altered by contact metamorphism, that are of Jurassic and Triassic age."

MOLYBDENITE.

A pegmatitic vein carrying large, pure flakes of molybdenite has been found in granodiorite somewhere near the Rubicon River by Mr. Sherry Willits, of Auburn. The size and extent of the deposit could not be learned.

QUARTZ.

Quartz crystals have been sold commercially from a vein near Shady Run by Mr. J. Churchill, of 42 E. Main street, Stockton. The deposit has not been worked for over two years.

TALC.

Talc or soapstone occurs rather commonly along fracture planes in many of the mines. A deposit has been reported in the Bobtail mine in the Rock Creek district. Owned by Wm. Recknagel, of Auburn.

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SACRAMENTO COUNTY.

By CLARENCE A. WARING, Field Assistant.

INTRODUCTION.

Two weeks were devoted in October, 1916, to the mineral industry of Sacramento County. Appreciation is here expressed for the courteous treatment and coöperation of the several operators.

DESCRIPTION.

Location, boundaries and area.

Sacramento County is bounded on the north by Sutter and Placer counties; on the south by the San Joaquin and Mokelumne rivers and Dry Creek; on the east by El Dorado and Amador counties, and on the west by the Sacramento River and Steamboat and Sutter Sloughs.

The county was organized in the year 1849 and covers an area of 983 square miles.

Population and county seat.

The population of the county in 1913 was 90,000—75,000 of which were centered in Sacramento, the county seat and State Capitol, situated at the confluence of the American and Sacramento rivers.

Topography and drainage.

Sacramento County lies mainly in the central valley of California, extending from the Sierran foothills on the east down to the Sacramento River on the west. The highest elevations in the county south-east of Folsom are less than 900 feet, while the lowest in the southwestern portion of the county are slightly below sea level.

The eastern portion of the county is well drained from the north by the American River, which empties into Sacramento River, and by the Cosumnes River and Dry or Jackson Creek, which drain into San Joaquin River by way of Mokelumne River. The western portion of the county is largely low land protected from flooding by levees.

Power.

Two power lines of the Pacific Gas and Electric Company enter the city of Sacramento from the northeast. The Great Western Power line crosses the western side of the county from north to south, making a detour east of the city of Sacramento. The American River Electric Company, owned by the Pacific Gas and Electric Company, serves the eastern part of the county with power lines, following the American River from Folsom to Sacramento and following the State Highway from Sacramento to Stockton.

Transportation.

The Southern Pacific main line enters the city of Sacramento from the southeast from Stockton and passes northeastward through the county to Roseville, Placer County. The company has branch lines from Sacramento to Placerville, El Dorado County by way of Folsom, and from Sacramento south along the east side of Sacramento River to Walnut Grove. The Western Pacific main line crosses the west side of the county from south to north through the city of Sacramento.

The Central California Electric Traction railway runs from Sacramento southeastward through the county to Stockton. The Oakland, Antioch and Eastern Electric railway crosses the river at Sacramento and runs southwestward to San Francisco. The Northern Electric railway runs north from Sacramento to Marysville.

Good highways radiate from the city of Sacramento to Stockton, Folsom and Roseville. Branch roads make all parts of the county easily accessible. River boats ply between Sacramento and San Francisco and furnish a cheap means of transportation.

ECONOMIC GEOLOGY.*

The higher northeastern portion of Sacramento County, in the region east and southeast of Folsom, is made up of diabase, amphibolite schist and slate.

To the extreme northeast in the region of Represa these old metamorphics are intruded by granodiorite, which is being quarried for stone. Ancient river gravels overlie these older rocks in the region of Mormon Island, where they were placed in the early days.

Along the lower foothills sedimentary strata of upper Cretaceous (Chico) and upper Eocene (Ione) age are exposed. These strata are composed of shales, sandstones, clays, sands and gravels interbedded with volcanic tuffs and breccias. They are overlain along the edge of the valley by alluvium. Where the American River enters the valley, broad terraces have been left on either side. These terraces are made up principally of gravels and sands which are being dredged for their gold content. Certain clays in the valley alluvium have been found to be suitable for the manufacture of brick, tile and terra cotta. Sands in the Sacramento River are being utilized for sand lime brick and for concrete work. Certain of the deeper alluvial sands have been found to yield natural gas, which is thought to be derived from underlying older sedimentary deposits.

*For a geologic map of eastern Sacramento County see U. S. Geol. Survey, folio reprint 3, 5 and 11, 1914.

MINERAL PRODUCTION.

The mineral production of Sacramento County during the year 1915 consisted of gold, silver, platinum, brick, natural gas and granite, valued at \$2,632,658. The county stands tenth among the counties of the state as a mineral producer and fourth as a gold producer.

SACRAMENTO COUNTY—Table of Mineral Production, 1880-1915 (inc.).

Year	1 Brick	4 Natural Gas	3 Gold	5 Platinum	6 Silver	2 Copper	7 Miscellaneous stone
1880			\$342,514				
1881			425,000		\$1,000		
1882			400,000				
1883			480,000				
1884			270,000				
1885			333,522				
1886			280,000				
1887			158,525		176		
1888			150,000				
1889			210,075				
1890			193,584				
1891			142,830		4		
1892			121,900				
1893			90,090				
1894	\$56,250		70,326				75,000 cu. ft. State's use.
1895	65,625		145,872				85,000 cu. ft. State's use.
1896	44,200		133,050				\$12,018
1897	16,700 *1,500		93,650				90,413
1898	44,000	\$12,000	57,301				18,135
1899	93,600	10,000	115,906				14,249
1900	53,400	11,750	176,007		986		17,296
1901	62,180		229,034		544	\$316	10,808
1902	78,198	31,200	425,894		330		19,516
1903	120,000	30,518	335,046		214		20,398
1904	30,000	39,200	419,287		75		26,161
1905	135,000	43,564	608,382	\$700	206		34,000
1906	108,000	52,874	986,624	200	3,640		19,920
1907	128,624	52,874	790,973		2,034		18,561
1908	63,491	55,000	1,166,055		1,621		195,628
1909		60,000	1,669,814		2,856		235,210
1910		49,203	1,396,874		4,606		210,287
1911	76,571	83,890	1,812,826		3,047		133,344
1912	161,535	96,000	1,712,587		3,544		197,733
1913	144,191	36,000	2,503,633		3,406		238,476
1914	160,923	40,000	2,164,491	7,600	3,500		253,235
1915	82,973	54,000	2,131,813	6,217	3,151		284,127
Totals	\$1,726,961	\$758,073	\$22,823,485	\$14,117	\$34,960	\$316	\$2,049,515

*Pottery.

MINERALS AND MINES.

BRICK.

The **Independent Pressed Brick Company**, formerly the Sacramento Sand Brick Company, is manufacturing sand-lime brick on the east bank of the Sacramento River, just above the Southern Pacific Railroad shops in the city of Sacramento. Fine sharp sand is teamed from the bed of the Sacramento River. Lime is crushed and raised by a small

bucket elevator to a pulverizer. The lime is then measured and dumped into a large revolving mixer with the proper proportion of sand. The two materials are thoroughly mixed and subjected, while being mixed, to jets of steam for about 20 minutes. The product is run through a Quaker brick machine and the green bricks piled on cars which are run into brick cylinders. The cylinders hold 9,000 bricks each and in them the bricks are subjected to steam for 9 or 10 hours, at which time the process is complete. The finished bricks are piled in sheds for shipment.

Any color of finished bricks may be produced by adding the desired color to the mixing cylinder. The finished bricks are claimed to become harder the longer they stand since the lime tends to recrystallize. The plant has a capacity of 12,000 bricks daily.

Crude oil, supplied from two 20,000 gallon tanks, is used as fuel for generating steam in a 60 h. p. boiler. Water is raised, by a 3 h. p. electric motor, from a 50' well into a 20,000 gallon tank for use at the plant.

Owned and operated by the Independent Pressed Brick Company, John Trede, president; F. A. Wilcox, vice president; Mrs. J. Trede, secretary, all of Sacramento.

The **Muddox Pottery Co.** manufacture sewer pipe from clay obtained from Amador County. The plant is at Thirtieth and L streets, Sacramento. H. C. Muddox, owner.

The **Panama Pottery Co.** manufacture ornamental pottery from clay obtained from Lincoln, Placer County. The plant is at Twenty-fourth Street road, Sacramento.

The **Riverside Brick Yard**, owned by the Sacramento Transportation Company, is located near Riverside, about three miles south of Sacramento city limits. Loamy soil, clay and sharp sand are steam-shoveled from the lowlands near the Sacramento River and hauled to the brick works upon the bank of the river in dump cars drawn by steam locomotives. The material is tempered with water, thoroughly mixed in pug mills and run through Monarch brick machines. The green bricks are dried in tiers in the drying yard and are then ready for burning in a continuous kiln 250' long, 60' wide and 12' high. The burned bricks are loaded on river barges ready for shipment. Common building bricks only are manufactured. About 85 men are employed during the brick-making season; enough bricks being made ahead to run the kilns during the winter. Between 5 and 6 million brick, per year, are produced and sold in San Francisco and Sacramento. Equipment consists of: 1 Marion steam shovel with a 1½ cu. ft. bucket on a 40' x 100' wood hull, 2 locomotives and 32 dump cars, 4 Monarch brick machines (2 now in use), 2 continuous kilns (1 in use). Coal is used for fuel throughout

the plant and about $2\frac{1}{2}$ tons are consumed in a kiln in 24 hours to produce 35,000 brick. Twenty-five men are employed all year. A 250 h.p. Corliss steam engine runs a shaft for all the brick machines, which are operated for from 3 to 4 months of each year and require about 30 men for each machine. The steam shovel digs to a depth of about 12 feet and is operated only about 2 months of each year. The company's plant at Freeport has been inoperative for several years.

The company office is at Front and N streets, Sacramento. P. G. Harney, president; H. Rolff, superintendent at the plant.

Bibl.: Rept. X, pp. 506-8, 1890.

The **Sacramento Clay Products** plant is located on lot 16 of Rancho del Paso, about 4 miles northeast of Sacramento on the Southern Pacific Railroad near the main highway to Roseville. Clay is taken from near the plant, mixed with clay from Lincoln, Placer County, and tempered with water. The stiff mud is run through presses. The plant is equipped with 1 Berg brick press, 2 American clay machines, 1 hollow tile machine and 4 kilns. Crude oil is burned in the kilns. Fourteen men are employed. The company manufactures fire brick, face brick, hollow tile and Denison interlocking tile.

Owned by the Sacramento Clay Products Company, J. P. Dargitz, manager, 311 Ochsner Building, Sacramento.



Photo No. 36. Wells Nos. 1, 6, 7, and 2 of the Sacramento Natural Gas Company, at the foot of Y street, Sacramento. Well No. 1 is to the left of the gas holder while No. 7 is housed in.

NATURAL GAS.

The **Sacramento Natural Gas Company** owns eight producing gas wells in the city of Sacramento on the east side of Sacramento River. The wells range from 1380' to 2935' in depth. Natural gas is brought up by artesian water and caught in traps which empty into large storage containers, the water flowing into the river. Water from well No. 3 is used in the Sacramento Swimming Baths. Gas is reported to have been first struck at a depth of 293 feet, but the larger flows come from a greater depth. The eight wells produce in the neighborhood of 250,000 cu. ft. of gas per day, which is consumed in the city of Sacramento. The company has an auxiliary plant for the manufacture of gas from crude oil.

Sacramento Natural Gas Company, 427 J st., Sacramento, J. N. Jensen, Manager; H. C. Keyes, Secretary.

Bibl.: Rept. X, p. 505; 1890, Bull. 3, pp. 5-15, 1894.



Photo No. 37. Wells Nos. 8 and 9 of the Sacramento Natural Gas Company, on the east bank of the Sacramento River. Well No. 9 is just south of the club house in the picture.

GOLD.

Gold was taken from the bed of the American River and from its benches solely by placering and sluicing until 1899, when the first gold dredge was put in operation in the county. After the first rich surface clean-ups were made, the gravels remaining were too deep to be worked economically on a small scale. The successful operation of dredgers, for recovering the gold from deep gravels, has kept up the county gold production since their institution. The reclamation dredges being used by the Natomas Company the last year are highly satisfactory and their use in other dredging fields should be encouraged.

Since dredging operations began the gold production and number of dredgers operating each year is as follows:

Year	Gross value	Increase* or decrease	Companies operating	Number of dredgers	Total dredgers
1899			Colorado-Pacific	1	1
1900	\$17,200	+\$17,200	Colorado-Pacific	1	
			Ashburton	1	2
1901	47,619	+30,419	Colorado-Pacific	1	
			Ashburton	1	
			Syndicate	1	3
1902	155,194	+107,575	Colorado-Pacific	2	
			Ashburton	1	
			Syndicate	1	4
1903	102,097	-53,097	Colorado-Pacific	1	
			Ashburton	1	
			Syndicate	1	3
1904	348,990	+246,893	Colorado-Pacific	1	
			Ashburton	1	
			Syndicate	1	
			Folsom Development Co.	2	5
1905	569,124	+220,134	Colorado-Pacific	1	
			Ashburton	1	
			Syndicate	1	
			El Dorado	1	
			Natoma	5	9
1906	921,300	+352,176	Colorado-Pacific	1	
			Ashburton	1	
			Syndicate	1	
			El Dorado	1	
			Natoma	5	9
1907	649,511	-271,789	El Dorado	1	
			Natoma	5	6
1908	1,179,196	+459,685	Ashburton	1	
			El Dorado	1	
			Natoma	8	10
1909	1,531,136	+424,940	Ashburton	1	
			El Dorado	1	
			Natoma	8	10
1910	1,369,594	-164,542	Ashburton	1	
			Natoma	7	8
1911	1,805,071	+435,477	Ashburton	1	
			Natoma	9	10
1912	1,672,797	-132,272	Natoma	9	
			Union	1	
			Ashburton	1	11
1913	2,498,693	+825,806	Natoma	10	
			Union	1	
			Ashburton	1	12
1914	2,161,653	-336,950	Natoma	10	
			Wilkesbarre (or Union)	1	11
1915	2,129,781	-31,872	Natoma	9	
			Wilkesbarre	1	
			Indiana	1	11
1916			Natoma	11	11
	\$17,091,866		Total dredge production.		

The best gold values are found along the ancient courses which the American River took to reach the valley. These old channels and their terraces are, in most cases, covered with from 20 to 70 feet of gravel, sand and alluvium, in places interbedded or overlain by beds of volcanic material. The north side of the American River, west of Folsom, is made up almost entirely of volcanic material which carries little or no value and covers the gravels so deep as to make dredging unprofitable. The bed of the river and the two terraces on the south side have yielded good values. The gravels in the lower terrace average between 6 and 8 cents per cubic yard, while those on the upper terrace average between 8 and 9 cents per cubic yard. The channel gravels are underlain by volcanic tuff and slate, from 12" to 18" of which is dredged to recover any values which may have worked into it. The main bedrock is not in all cases reached by the dredgers, but where the slate is reached excellent values are found.



Photo No. 38. Dredger No. 4 of the Natomas Consolidated of California, under construction in November, 1915. The first reclaiming gold dredge built in California.

The following table shows the history of dredging in Sacramento County since its beginning:

TABULAR HISTORY OF SACRA

Company	Dredger No.	Type of construction	Year commissioned	Number and type of buckets	Bucket capacity, cubic feet	Rated capacity, horsepower
Colorado-Pac. Gold Dredging Co. Ashburton or New England Exploration Co.	1	Risdon (steam)	April, 1899	Open link	3½	-----
	2	Risdon (elec.)	1902	-----	5	-----
	1	Bucyrus	Mar. 1, 1900	Double lift Open link	7½	-----
	2	Bucyrus	May, 1908	Single lift Close conn.	7	-----
	1	Risdon	1901	Open link	5	-----
Syndicate ----- Folsom Development Co.-----	1	Western Eng. Const., Bucyrus	Feb. 20, 1904	Close conn.	5½	-----
	2	Western Eng. Const., Bucyrus	Mar. 16, 1904	Close conn.	5½	-----
	3	Company Const., Bucyrus	Jan. 1, 1905	87 close conn.	8½	490
	4	Company Const., Bucyrus	Nov. 15, 1905	68 close conn.	13	415
	5	Western Eng. Const., Bucyrus	Dec. 10, 1905	73 close conn.	9	540
	6	Western Eng. Const., Bucyrus	Mar. 8, 1908	86 close conn.	9	790
El Dorado Gold Dredging Co. Wilkes-Barre Dredging Co.	1	Risdon	April 25, 1905	Open link	7	-----
Natoma Development Co., (absorbed the Colorado Pacific, Syndicate and Natomas Vineyard properties.)	1	Yuba Const. Co., Bucyrus	Nov. 10, 1911	-----	-----	-----
	2	Yuba Const. Co.	May 10, 1908	61 close conn.	13½	645
	3	Yuba Const. Co.	April 22, 1908	Close conn.	8	-----
	3	Yuba Const. Co.	July 2, 1908	61 close conn.	8	-----
Natomas Consolidated (absorbed the Natoma Development Co., El Dorado Gold Dredging Co., Folsom Development Co. and Wilkes-Barre Dredging Co.)	1	Natoma, No. 1	Dec., 1916	67 close conn.	15	711.5
	2	Natoma, No. 2	April 22, 1908	68 close conn.	8½	463
	3	Natoma, No. 3	July 2, 1908	72 close conn.	8½	438
	4	Folsom, No. 4	Nov. 15, 1905	67 close conn.	15	600
	5	Folsom, No. 5	Dec. 10, 1905	82 close conn.	9	528
	6	Folsom, No. 6	Mar. 8, 1908	86 close conn.	9	505
	7	Folsom, No. 3	May, 1913	98 close conn.	9	613
	8	Yuba Cons. Co.	Jan. 23, 1911	83 close conn.	15	1,122
	9	Yuba Cons. Co.	Aug. 10, 1911	83 close conn.	15	1,146
	10	Yuba Cons. Co.	Sept. 30, 1912	83 close conn.	15	1,165
	11	Yuba Cons. Co.	Nov. 10, 1914	-----	9	595

MENTO COUNTY DREDGERS.

Type of screens	Dredger capacity, cubic yards per month	Depth dredged, feet	Acres dredged	Days operated	Cubic yards dredged	Cost per cubic yard in cents	Remarks
Shaker	35,000	-----	25	1,460	960,000	-----	Dismantled 1903.
Shaker	60,000	-----	54	1,460	2,100,000	-----	Dismantled 1906.
Shaker	115,000	26	155	2,555	6,000,000	7.8	Dismantled 1906.
Shaker	90,000	12-48	8	210	450,000	8	Dismantled 1913.
Shaker	-----	-----	103	2,012	3,000,000	-----	Closed down 1906.
Shaker	56,000	Av. 45	54	1,655	2,995,000	-----	Dismantled Aug. 20, 1908.
Shaker	-----	Av. 17	150	1,380	5,350,000	-----	Dismantled Jan. 14, 1909.
Revolving	180,000	30	*81.5	1,460	*3,600,000	-----	Dismantled May, 1912, and machinery used in building Natoma No. 7.
Revolving	250,000	Av. 20	*209	1,140	*6,500,000	3.0	Renamed Natoma No. 4. Dismantled.
Revolving	-----	50-75	*39	1,110	*3,500,000	-----	Renamed Natoma No. 5. Still operating.
Revolving	130,000	Av. 60	*18.9	285	*1,565,598	5.8	Renamed Natoma No. 6. Still operating. Monitor equipment.
-----	-----	-----	40	1,335	1,260,000	-----	Dismantled 1909.
-----	-----	-----	\$26	474	1,601,000	8.46	Discontinued operations Feb. 29, 1916.
Shaking	250,000	Av. 19	†60.02	225	*3,048,254	2.4	Rebuilt Feb.-Nov., 1916, as reclaiming dredge.
Revolving	162,000	Av. 24	†16.23	135	*626,300	2.4-3.1	
Revolving	102,000	Av. 42.5	8.50	180	583,900	3.9	
Revolving	270,000	32	\$611.00	\$2,584	\$21,812,000	3.22	Rebuilt Nov. 1, 1914-Jan. 13, 1916, as reclaiming dredge.
Revolving	170,000	35	\$368.00	\$2,727	\$14,789,000	4.00	
Revolving	140,000	40	\$272.00	\$2,729	\$13,567,000	4.48	
Revolving	250,000	22	\$499.00	\$2,287	\$18,177,000	3.01	Sank June 8, 1913. Resumed operations Nov. 2, 1913.
Revolving	140,000	50	\$139.00	\$2,577	\$11,412,000	5.06	
Revolving	130,000	50	\$131.00	\$2,721	\$11,010,000	6.58	
Revolving	180,000	60	\$174.00	\$2,259	\$9,518,000	6.00	Sank May 4, 1912. Resumed operations May 14, 1913.
Revolving	200,000	60	\$94.00	\$1,519	\$9,401,000	5.51	
Revolving	200,000	60	\$122.00	\$1,778	\$11,673,000	5.84	
Revolving	200,000	60	\$140.00	\$1,363	\$9,120,000	5.27	Burned Oct. 20, 1911. Resumed operations Jan. 20, 1913.
Revolving	-----	-----	\$5.00	\$76	\$353,000	4.87	

*To January 1, 1909. †During eight months. ‡First eight months. §To June 30, 1916.

Acquired from Wilkes-Barre Dredging Co. on Mar. 28, 1916.

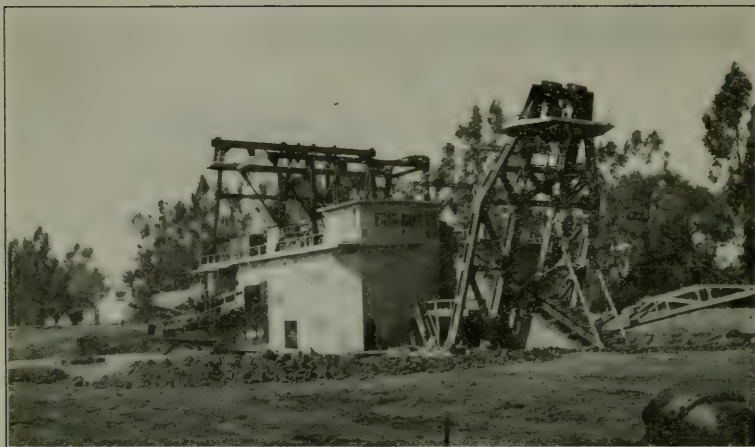


Photo No. 39. Reclaiming Dredge No. 4 of the Natomas Consolidated of California, showing bucket line, operating at Nimbus, Sacramento County. September, 1916.



Photo No. 40. Reclaiming Dredge No. 4 of the Natomas Consolidated of California, showing the arrangement of the tailings stackers. Operating at Nimbus, Sacramento County. September, 1916.

The dredgers of the **Natomas Consolidated** are all run by electricity supplied by the Great Western Power Company and the Western States Gas and Electric Company. The tendency the last few years has been to build the boats with steel hulls and enlarge the bucket capacity. The latest type of boat in this field is the reclaiming gold dredge of which Natomas No. 4 is a working example. This dredge is equipped with 15 cubic foot buckets and revolving screen the same as the other large type dredgers, but additional tailings stackers have been added. Two stackers handle the coarse discharge from the revolving screen, while two other stackers handle the fines from the riffles. The lengths of the four stackers are so arranged that the coarse material is deposited nearest the boat and the fine material at a distance, so it will run back towards the boat and fill the interstices between the cobbles. The revolving motion, back and forth, of the boat distributes the tailings evenly across the fill. The land needs but little leveling to fit it for agricultural purposes again and the Natomas Company maintains its own reclaiming department, which is replanting the dredged grounds to orchards and vineyards. Emery Oliver, manager, Forum Building, Sacramento.

Bibl. : Bull. 57. pp. 174-205.



Photo No. 41. Dredge No. 1 of the Natomas Consolidated of California, being rebuilt as a reclaiming dredge, near Fair Oaks, Sacramento County. September, 1916.



Photo No. 42. Dredge No. 1 of the Natomas Consolidated of California, being rebuilt as a reclaiming dredge, near Fair Oaks, Sacramento County. November, 1916.



Photo No. 43. Dredger No. 9 of the Natomas Consolidated of California, operating south of Natomas, Sacramento County.

GOLD—DRIFT MINING.

The **Gray Mining Company** are drifting from the bottom of a 40' shaft near the head of Alder Creek, at the old "Rhodes Diggings," 3 miles southeast of Folsom. Elevation 350'. Early work in this region consisted of surface placering, and then the Embach Mining Company did some drifting from a shaft fitted with electric hoist. Present work is being carried on about one-half mile further up the creek, where coarse gold is being taken from blue gravel on a slate bedrock. The channel is thought to run north-south and to be about 50' wide and 4000' long. It is covered with volcanic gravel and tuff and present work consists of opening up the channel. Equipment consists of a 16' hoist and horse whim; 7½ H.P. distillate engine and valveless rotary pump. Three men are employed in the mine and three work on the surface.

The company, consisting of D. P. Gray and son E. R. Gray of Folsom, and C. J. Heeseman of Oakland, are leasing the ground from John A. Britton of San Francisco.

MISCELLANEOUS STONE.

Crushed rock.

The **Natomas Consolidated** of California, owns a large rock crushing plant at Fair Oaks which converts dredge tailings to a commercial product. Pebbles and boulders are loaded by a steam shovel, with 2½ cu. yd. bucket, into dump cars having a capacity of 4 cu. yds. each. Two narrow gauge locomotives and 30 dump cars are used. Clean gravel is dumped into bins and carried by a 380' conveyor belt to a



Photo No. 44. Bucket line of Dredger No. 9 of the Natomas Consolidated of California, operating at Natoma, Sacramento County.

revolving screen. Dirty or wet gravel is passed through a revolving screen, 6' in diameter and 30' long with $\frac{1}{4}$ " holes, where it is washed; everything over $\frac{1}{4}$ " passing to the conveyor belt with the dry clean gravel. The fine slickens is washed down a flume and distributed over the leveled land. The gravel is then carried to a screen 5' in diameter by 30' long with $2\frac{1}{2}$ " perforations. Everything over $2\frac{1}{2}$ " in diameter is crushed, the dust washed out, and run through siziers for the following: $\frac{1}{8}$ " x $\frac{1}{2}$ ", $\frac{3}{4}$ " x 1", $1\frac{1}{2}$ " x $2\frac{1}{2}$ ", dust x $\frac{3}{8}$ ". The balance of the

material is stored as washed gravel. The following crushers are used: One 42" x 26" jaw crusher, 7-36" x 10" jaw crushers and 1-48" Symons disc crusher. A conveyor belt passes under all of the discharge belts and any mixture of sized rock can be obtained. The railroads are arranged under the conveyor belts so that the cars run from the yard by gravity. The production of the plant is about 1500 tons of crushed rock and 500 tons of washed gravel in 10 hours.

Natomas Rock Crushing Department, Forum Building, Sacramento, or Alaska Commercial Building, San Francisco.

Bibl.: Bull. 57, p. 203.



Photo No. 45. Loading cobbles with steam shovel for Natoma Rock Crushing Plant near Fair Oaks.



Photo No. 46. Natoma Rock Crushing Plant near Fair Oaks.

GRANITE.

The Folsom Granite Quarry is situated on the east bank of the American River at Folsom State Prison. The grounds include 483.92 acres, practically all of which is made up of granodiorite and diabase. The quarry sites are about 50 feet above the bed of the river and just east of the canal.

Early work was carried on in diabase, the contact of which, with the granodiorite crosses the American River just north of the site of the old rock crusher. The farther this rock was quarried into the hill the deeper it was decomposed until 100' back from the river bank a 100' face shows 50' of decomposed rock. Work was also carried on in granodiorite in an old quarry just below the dam, but better rock has been opened up at the quarry now being worked just east of the prison power plant. The granodiorite is dark and medium-grained and the prison buildings built of it in 1888 show no sign of weathering. All work is done by prison labor. Equipment consists of hand and hammer drills, two derricks, and a tramway to the prison grounds. The convicts are taught to quarry, cut stone and do the masonry and some have even attempted sculptural work.



Photo No. 47. Granite Quarry at Folsom State Prison, Represa, Sacramento County. Worked by the convicts at the prison. Courtesy of J. J. Smith, Warden.

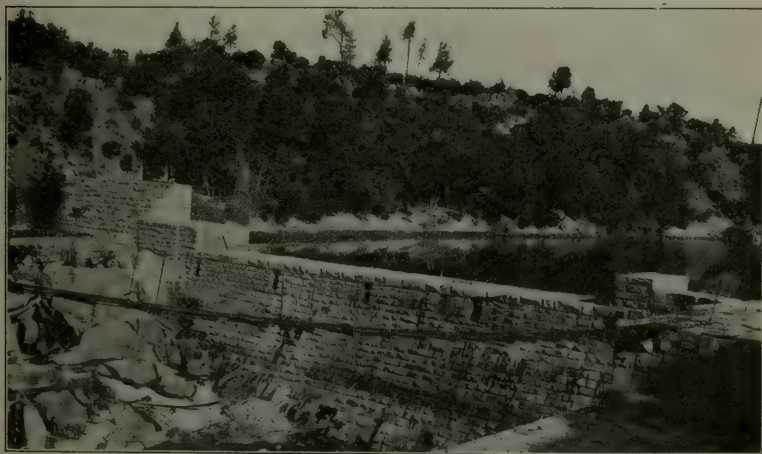


Photo No. 48. Dam across the American River at Folsom State Prison, built of granite blocks from the prison quarry by convict labor.

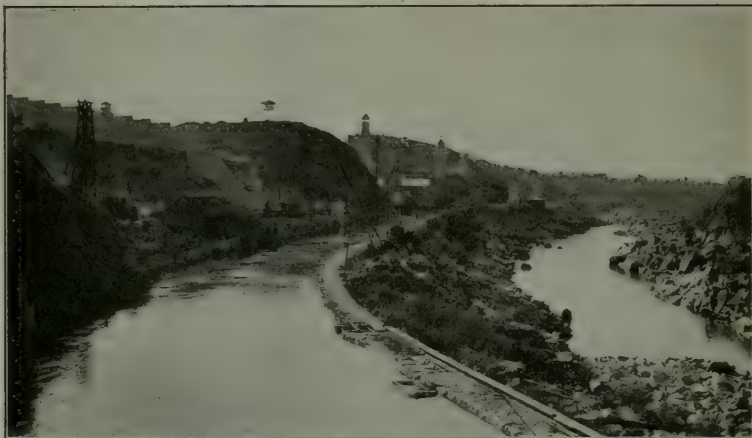


Photo No. 49. View down the American River from the Folsom Prison dam, showing granite outcrops along the river bed and along cuts made for the outlet canal. The prison buildings and walls were built of granite blocks by convict labor.

The granite blocks have been cut for use in the prison buildings, walks, dam, canal, etc. Rip-rap is used along the canal and about 8000 tons per year is sold for railroad ballast.

Owned by the Folsom State Prison, J. J. Smith, warden, Represa, California.

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Geologic Folio No. 5, Reprint of Sacramento Quadrangle. Professional Paper No. 73, Tertiary Gravels of the Sierra Nevada Mountains, by Waldemar Lindgren, 1911.

YUBA COUNTY.

By CLARENCE A. WARING, Field Assistant.

INTRODUCTION.

Four weeks were spent by the writer, in August, 1915, doing field work in Yuba County. All available information was first obtained at Marysville and vicinity, after which the route took in Browns Valley, Strawberry Valley, Eagleville, Woodleaf, Challenge, Rackerby, Oregon House, Dobbins, Comptonville, Smartsville, Waldo and Wheatland.

The writer endeavored to obtain reliable information concerning all operating mines, old mines and prospects.

Appreciation is here expressed for the courteous treatment and coöperation of the several mine owners and operators.

DESCRIPTION.

Location and boundaries.

Yuba County lies in the north central part of the state and borders the east side of the Feather River. It is bounded on the northwest by Butte and Plumas counties, on the southeast by Placer and Nevada counties and on the east by Sierra County.

Area.

It was organized in 1850 and covers an area of 625 square miles, or 400,000 acres.

Population and county seat.

The population in 1910 was 10,042, of which 5,430, or over one-half, were at Marysville, the county seat, situated at the confluence of the Feather and Yuba rivers.

Topography and Drainage.

Extending as it does, from the Feather River into the middle western slope of the Sierra Nevada Mountains, Yuba County includes diversified topography and climate. The main drainage systems of the Yuba and Bear rivers and Honey Creek carry all waters to the southwest into Feather River.

Vegetation.

Trees in the valley region consist of oaks and willows, while in the foothills oaks and digger pine predominate. In the more elevated eastern portion of the county, red pine, sugar pine, fir, cedar, and laurel-oak are abundant, and lumbering is one of the principal industries. Grains do well in much of the region. Rice and hops are yielding good returns in the region about Marysville and Wheatland, respectively.

Power.

The western and southeastern parts of the county are well provided with power lines. The Pacific Gas and Electric Company, with power plant at Colgate, has a line southwestward through Smartsville, with branches to Wheatland, Yuba County, and Van Trent, Placer County; also a branch northwestward through Bangor, Butte County. Another line eastward to Nevada City, with branch northward to Alleghany, Sierra County, serves the southeast corner of Yuba County. Branches from the main lines could easily be extended to most any part of the county.

Water power is available in many of the streams during the winter and spring. Internal combustion engines are often cheap and practicable.

Transportation.

The San Francisco and Portland line of the Southern Pacific railroad crosses the southwestern part of the county through Wheatland and Marysville, while the Northern California line of the same company runs northward from Marysville.

The Western Pacific railroad crosses the west side of the county and is paralleled south of Marysville by the Northern Electric railroad, which crosses the Feather River north of Marysville.

Fair mountain roads tap all the northeastern and mountainous portions of the county.

GENERAL GEOLOGY.

The general geology of Yuba County is similar to that in the adjoining, Nevada and Placer, counties.

The main central portion of the county consists generally of gabbrodiorite and granodiorite grading off on either side into the more basic diabases, which in turn grade into metamorphic, amphibolitic rocks. Schists and slates in places overlie the igneous rocks and are intruded by serpentine in the northern part of the county. Alluvial sands and gravels cover the entire western portion of the county, while auriferous gravels, in places, lie along the old channel courses.

The general trend of the rock formations is northwest-southeast.

ECONOMIC GEOLOGY.

The areal geology of Yuba County has been covered by U. S. Geological Survey Folios Nos. 17, 18 and 43, but no detailed work has been done on the geologic occurrence and association of ore bodies.

The northeastern portion of the county is crossed from southeast to northwest by the serpentine, slate and amphibolite belt which accompanies the Mother Lode southward. The region includes many quartz veins which in places carry gold values with pyrite. The veins are, as a rule, pockety.

The central portion of the county is made up of granodiorite, gabbrodiorite, diabase and amphibolite schist, which have a northwest-southeast trend and include quartz veins carrying gold with pyrite, galena and chalcopyrite. In the western portion of the area the veins carry a larger proportion of copper sulphides, and a belt along the foothills which carries good gold values from concentration on the surface carries fair copper values with depth.

Ancient river channels throughout the northeastern and central portions of the county carry considerable gold.

Asbestos, chrome and manganese are usually associated with serpentine areas, while talc is often found along fracture planes in the schists.

The western portion of the county is made up of gravel and alluvial wash from the mountains to the east. The gravels in places carry gold values, which make them good dredging land.

Sand in the bed of Yuba River is used for construction work, and clay beds along the alluvial slopes are available for brick and pottery.

MINERAL PRODUCTION.

The mineral production of Yuba County during the years 1914 and 1915 consisted of gold, platinum, silver and sand. The demand for minerals during the last year has encouraged the opening up of other prospects which are now adding to the state's production of chrome and manganese.

Other mineral deposits of possible economic value, but as yet undeveloped, are: asbestos, clay, copper, ochre, and soapstone.

YUBA COUNTY—Table of Mineral Production, 1880-1915 (incl.).

Year	Brick	Clay	Gold	Macadam	Mineral water	Sand	Silver	Miscellaneous
1880			\$943,660				\$438	
1881			800,000				1,300	
1882			750,000					
1883			455,000					
1884			250,000					
1885			207,448					
1886			149,203					
1887			162,426					
1888			150,000					
1889			112,053				15	
1890			141,781					
1891			37,576					
1892			44,218					
1893			30,839					
1894			107,480					
1895			111,482					
1896			171,687					
1897			141,638					
1898			166,665					
1899			189,927					
1900			280,366				4,625	
1901			188,908				846	
1902			155,630				2	
1903			125,830				41	
1904	\$3,000	\$750	139,528					
1905		80	324,135		\$800		369	
1906					800			
1907			1,766,770		720		6,187	
1908	10,000		2,034,486	\$5,750			9,997	
1909	6,600		2,469,865	5,650			4,156	1,868,564
1910			3,204,273				5,372	
1911			2,997,072			\$9,318	5,299	
1912			2,753,408			15,526	6,198	
1913			2,491,505			8,063	7,571	
1914			2,800,000			14,895	6,000	2,377
1915			2,703,710			149,292	5,254	2,174
Totals	\$19,600	\$830	\$20,558,969	\$11,400	\$2,320	\$197,094	\$63,670	\$375,115

¹Unapportioned, 1900-1909.²Platinum.

MINING DISTRICTS AND ACTIVE MINES.

The following mining districts listed by the United States Geological Survey,¹ with the addition of the Strawberry Valley district, are here outlined, together with the names of the active mines in them. Names of producing mines are *italicized*.

The **Browns Valley** district includes all quartz and placer mines along Browns Valley Ridge, 10 miles northeast of Marysville. Diabase and amphibolite schist are the prevailing rock formations. Active properties: None in 1916.

The **Brownsville** district includes all quartz, placer and drift mines in the region about Brownsville, which lies 34 miles northeast of Marysville and 36 miles east of Oroville. It includes Rackerby, Challenge and Woodleaf. The prevailing country rock is granodiorite and diabase. Active properties: B. A. C. Quartz Mine, Beehive or Mt. Hope Quartz,

¹J. M. Hill. Mining Districts of the Western United States. U. S. Geol. Survey Bull. 507, pp. 112-13, 1912.

Beaver Quartz, Easy Money Quartz, Horseshoe Quartz, Santa Rosa Quartz.

The **Camptonville** district includes all quartz and placer mines in Yuba County east and south of the North Yuba River, in the region about Camptonville, 47 miles northeast of Marysville and 23 miles north of Nevada City. The prevailing country rock is granodiorite, diabase and amphibolite, slate, quartzite and limestone. Active properties: None.

The **Dobbins** or **Indiana Ranch** district includes all quartz and placer mines in the region about Dobbins, 30 miles northeast of Marysville. It includes Oregon House, Frenchtown and the region west of the Yuba and North Yuba Rivers. The prevailing country rock is gabbrodiorite and diabase. Active properties: *California Mother Lode*,* Eich Quartz, Good Title Quartz, Red Cross Quartz.

The **Marysville** (Yuba Basin) district includes all placer and dredging property along the lower Yuba River. Alluvial sands and gravels are the mineral carriers. Active properties: *Marysville Dredging Co.*, *Pacific Gold Dredging Co.*, *Yuba Consolidated Goldfields Co.*, *Marysville Sand Co.*, *Pratt Building Material Co.*, *Yuba River Sand Co.*

The **Smartsville** district includes all quartz and placer mines, in Yuba County, in the region of Smartsville, 27 miles east of Marysville and 14 miles west of Grass Valley. It also includes Waldo, or Cabbage Patch, and Sicard Flat. Diabase is the prevailing country rock. Active properties: *Boston Hill* or *Barton*, *Wheaton* or *Julius Caesar*, *Alcalde Placer*, *Archimedes Placer*, *Industry Bar Placer*, *Lone Tree Quartz*.

The **Strawberry Valley**, or **Eagleville** district, includes all quartz and placer mines in Yuba County, in the region about Eagleville, Strawberry Valley and Clipper Mills, Butte County, and southward to the North Yuba River. Gabbrodiorite, slate, amphibolite and serpentine are the prevailing rock formations. Active properties: None.

The **Wheatland** district includes all placer mines in Yuba County along the lower part of Bear River. Alluvial sands and gravels are the mineral carriers. Active properties: None.

MINERALS AND MINES.

ASBESTOS.

Small amounts of amphibole slip-fiber asbestos occur in the serpentine areas of the northern portion of Yuba County. No deposits of commercial importance have been developed, but the following prospects and outcrops were noted:

1. Small seams in serpentine exposed in old hydraulic workings at Galena Hill, in Sec. 35, T. 19 N., R. 8 E., at an elevation of 2900 feet, on the property of W. S. Godfrey, of Camptonville.

*Names of producing mines are italicized.

2. Small seams exposed in serpentine $1\frac{1}{2}$ miles east of south of Challenge on Pike County Hill, at an elevation of 3000 feet. No work.

3. Small seams along contact between serpentine and slate in the shaft of the Mt. Hope quartz mine at an elevation of 3100 feet, in Sec. 8, T. 19 N., R. 7 E., near Challenge.

4. Small seams in serpentine in road-cut and old tunnel in Sec. 18, T. 19 N., R. 7 E., M. D. M., on road from Challenge to the Mt. Hope Mine.

5. Very small seams in serpentine exposed by hydraulic work in the old Kingbird drift mine in Sec. 36, T. 20 N., R. 7 E., M. D. M. Elevation 3800 feet near Clipper Mills, on patented land.

6. Small seams in serpentine in road-cut one mile west of Strawberry Valley.

7. The Butte County Pine and Hardwood Co. have sunk a 20-foot prospect shaft, one-half mile below the Mount Hope Mine, near the road to Oroville, at an elevation of 3000 feet. White slip fiber amphibole asbestos of fair quality occurs more or less irregularly along a serpentine-slate contact.

BAUXITE.

Bauxite has been reported¹ from the J. F. Dempsey Ranch, 2 miles southeast of Smartsville. Analysis of samples taken from the deposit have proved it to be only a white siliceous clay.

The deposit was encountered while running a 300-foot tunnel to cross-cut a supposed copper bearing ledge which carries pyrite only.

CLAY.

Shipments of clay were occasionally made, before 1905, by **D. P. and R. H. Durst**, of Wheatland, to Gladding, McBean and Company, of Lincoln, Placer County.

The black clay loam used was 6 feet deep and overlain by 18 inches of soil. Deposits similar to that on the Durst Ranch are abundant in the valley portion of Yuba County.

A siliceous, white clay, formerly reported to be bauxite, was taken from a tunnel on the **J. F. Dempsey Ranch**, 2 miles southeast of Smartsville. Kaolin to be used in the manufacture of fire brick has recently been reported to be shipped from the Dempsey Ranch, to Oakland.

COPPER.

The **Ayer Mine** on the Brady ranch, 4 miles west of Smartsville, is in Sec. 35, T. 16 N., R. 5 E., M. D. M., on patented land at an elevation of 300 feet. The ore consists of pyrite and chalcopyrite in a quartz vein. Some calcite is present. The vein is about 3 feet wide as exposed by the gossan and strikes N. 40° W. The dip is nearly vertical. A

¹Register of Mines and Minerals, Cal. State Mining Bureau, October, 1905.

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thirty-foot shaft has been sunk on the vein, which has walls of slate. Idle. Owned by Frederick Ayer, of Marysville.

A deposit of copper reported on the **John Dempsey ranch**, in Sec. 3, T. 15 N., R. 6 E., M. D. M., one mile south of Smartsville at an elevation of 750 feet, shows only pyrite. Prospecting for copper in 1911 by a 126-foot shaft and two 135-foot tunnels disclosed only sulphur and pyrite. The strong sulphuretted water of a spring near the mouths of the tunnels acts on scrap iron and leaves a deposit of ferrous iron, which oxidized to ferric iron and then to red iron oxide in a short time.

GOLD—DREDGERS.

Gold dredging along the Yuba River commenced in the latter part of 1903. Since operations began the gold production and number of dredgers operating each year is as follows:

Year	Amount	Increase+ or decrease-	Companies operating	Number of dredgers	Total dredgers
1903	\$25,736		W. P. Hammon and R. D. Evans.....	1	1
1904	74,263	+ \$48,527	W. P. Hammon and R. D. Evans.....	2	2
1905	188,967	+114,704	Yuba Cons. Gold Fields.....	8	8
1906	1,265,165	+1,016,198	Yuba Cons. Gold Fields.....	8	
			Marysville Dredging Co.....	2	10
1907	1,683,032	+482,867	Yuba Cons. Gold Fields.....	10	
			Marysville Dredging Co.....	2	12
1908	1,969,069	+281,047	Yuba Cons. Gold Fields.....	12	
			Marysville Dredging Co.....	2	14
1909	2,441,919	+472,840	Yuba Cons. Gold Fields.....	12	
			Marysville Dredging Co.....	2	14
1910	3,172,476	+730,557	Yuba Cons. Gold Fields.....	12	
			Marysville Dredging Co.....	3	15
1911	2,964,737	-207,739	Yuba Cons. Gold Fields.....	11	
			Marysville Dredging Co.....	2	13
1912	2,716,197	-248,540	Yuba Cons. Gold Fields.....	12	
			Marysville Dredging Co.....	2	14
1913	2,420,455	-295,742	Yuba Cons. Gold Fields.....	10	
			Marysville Dredging Co.....	2	12
1914	2,755,734	+335,270	Yuba Cons. Gold Fields.....	10	
			Marysville Dredging Co.....	2	12
1915	2,676,090	-79,644	Yuba Cons. Gold Fields.....	10	
			Marysville Dredging Co.....	2	12
1916			Yuba Cons. Gold Fields.....	11	
			Marysville Dredging Co.....	3	
			Pacific Gold Dredging Co.....	1	15
Total	\$24,298,840				

The map shows the area which has been dredged thus far.

The gold occurs in pay streaks in old river gravels which overlie a bedrock of volcanic tuff and are overlain by from 10' to 40' of hydraulic tailings. The bedrock lies from 30' to 110' from the surface and, as a rule, carries no values.

The Yuba River furnishes abundant water for floating the dredgers, which handle all the gravel and a few inches of the bedrock. The total gravel handled averages from 10¢ to 30¢ per cubic yard.

In 1916 there were two companies operating, with a third company building a dredger.

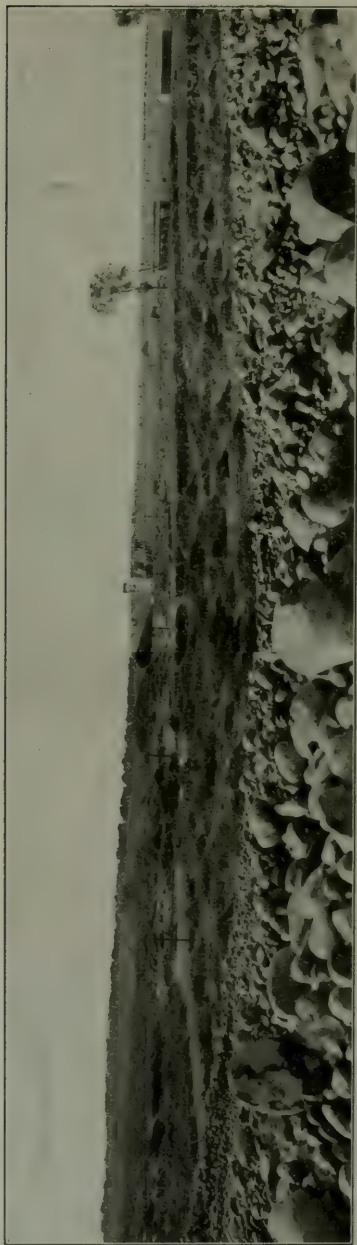


Photo No. 50. View northward showing Marigold dredgers Nos. 3 and 4 and new bunk houses and a portion of the area to be dredged.

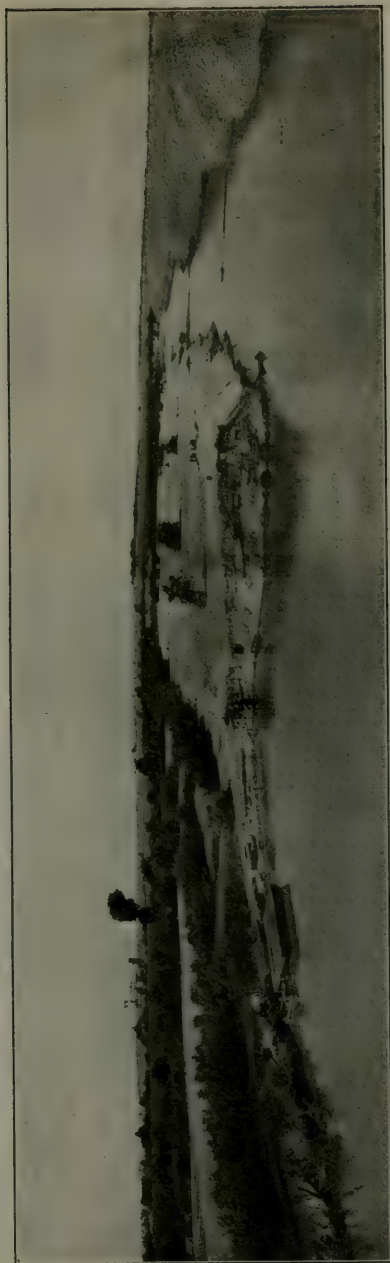


Photo No. 51. View southwestward, showing Yuba Consolidated dredger No. 13, from Yuba dredger No. 12.

The **Marysville Dredging Company** is operating three dredgers northwest of Marigold, a dredging town 8 miles northeast of Marysville.

Dredgers Nos. 3 and 4 each have 84 9-cubic-foot buckets, and each handles about 2,500,000 cubic yards of gravel per year, covering an area of from 20 to 25 acres. They excavate to a depth of from 50' to 80', and operate on an average of about 88% of the time. The total cost of operation, material, labor, electricity, repairs, general expense (including depreciation and fixed charges), taxes and insurance, is less than 5¢ per cubic yard. The gravels are thought to average about 15¢ per cubic yard. The tailings conveyor belts last about 8 months. Electric power is used to operate each dredge and two shifts of 3 men each are employed. The tables are cleaned up every ten days.



Photo No. 52. View northwestward of Marigold dredge No. 3, one mile northwest of Marigold, Yuba County. September, 1915.

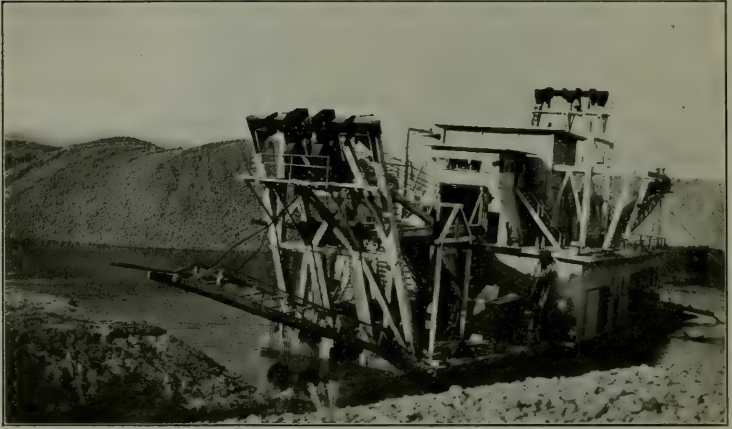


Photo No. 53. View northwestward of Marigold dredge No. 4, one mile northwest of Marigold, Yuba County. September, 1915.

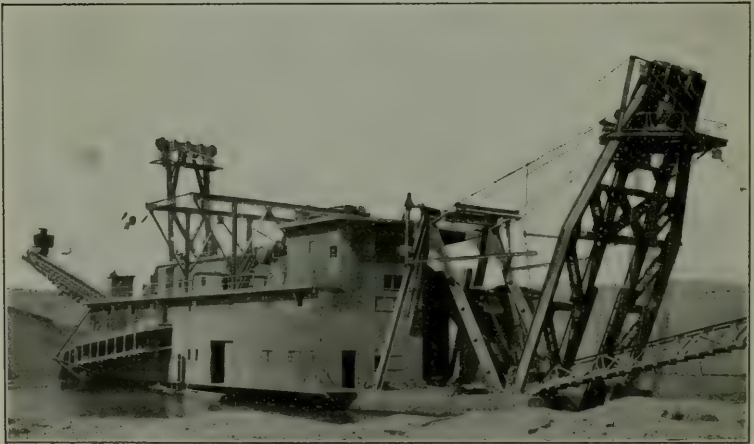


Photo No. 54. Marigold Dredge No. 5 operating at Marigold, Yuba County. September, 1916.

The company builds its own dredges, the machinery being furnished by the Union Iron Works, of San Francisco. The dredges complete cost about \$200,000 each.

The head office of the company is at 14 Ashburton Place, Boston, Mass., and its president is F. Lothrop Ames. The local office is at Marigold, with Thos. D. Harris, manager, and A. D. Snodgrass, cashier.

The **Pacific Gold Dredging Company**, formerly the Yukon Gold Dredging Company, controlled by the Guggenheim Mining Syndicate, has secured about one and one-half miles along the Yuba River, extending from the property of the Yuba Consolidated Goldfields Company to the river narrows. It lies below the Parks Bar bridge in Sec. 25, T. 16 N., R 5 E., M. D. M., and is reached from the Browns Valley road.



Photo No. 55. Gravel deposits, consisting of hydraulic tailings overlying pay gravels, in the Yuba River below Park's Bar Bridge. The arrow marks the location of the new Pacific dredger. September, 1916.

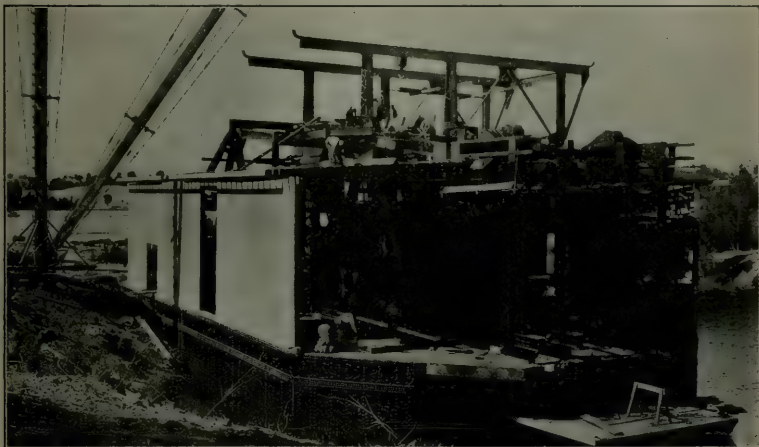


Photo No. 56. Pacific Gold Dredge under construction below Park's Bar Bridge on the Yuba River, Yuba County. September, 1916.

The company in September, 1916, had 50 men at work constructing a Marion type dredger with 100 9-cubic-foot close-connected buckets and revolving screen. The hull is 12' deep, 60' wide, and 135' long. The boat will have a rated h. p. of 700 and will dig 70' below the water line. The dredger will probably be running by 1917. R. Guggenheim, president, 417 Hobart Building, San Francisco; Chas. K. Lipman, secretary; H. C. Perring, superintendent, Marysville.

The **Yuba Consolidated Goldfields Company** is operating eleven dredges on their property north and northwest of Hammonton, a town



Photo No. 57. Yuba Consolidated dredger No. 13, one and one-half miles west of Hammonton. September, 1915.



Photo No. 58. View westward from the tailings pile of Yuba dredge No. 14 in the foreground and Nos. 11 and 9 in the distance. September, 1915.

of dredging people named after W. P. Hammon. The property adjoins that of the Marysville Dredging Company to the north and northeast. The company owns the old settling basin south of Hammonton and also considerable land south of Browns Valley in the region of Dry Creek, all of which is dredgeable.

The eleven dredges are all run by electricity and were mostly designed and built by the Yuba Construction Company of Marysville. The latest dredges are now built with steel hulls, excavate to a depth of from 70' to 80' below the water line, handle about 10,000 cubic yards of gravel per day and cost from \$300,000 to \$500,000 each.

The yardage handled is figured from bank measurements since there is about 20% expansion while working. Recovery of values ranges between 70% and 100%. The total cost of operation runs slightly below 5¢ per cubic yard. The gold values average between 16¢ and 17¢ per cubic yard.

The dredger crews on the small boats consist of 1 dredgemaster, 1 winchman, 2 oilers and 1 helper. The large boats require an extra oiler. A repair crew of 25 men and a shop crew of 20 men are employed for the 11 dredges, besides teamsters, truckmen, etc. Wages are as follows: dredgemaster \$150.00 per month, winchman \$4.00 per day, oilers \$3.00 per day, helpers \$2.50 per day, shop men \$2.50 to \$5.00 per day.



Photo No. 59. Dredger No. 14 of the Yuba Consolidated Goldfields working 2 miles northeast of Hammonton. September, 1915.

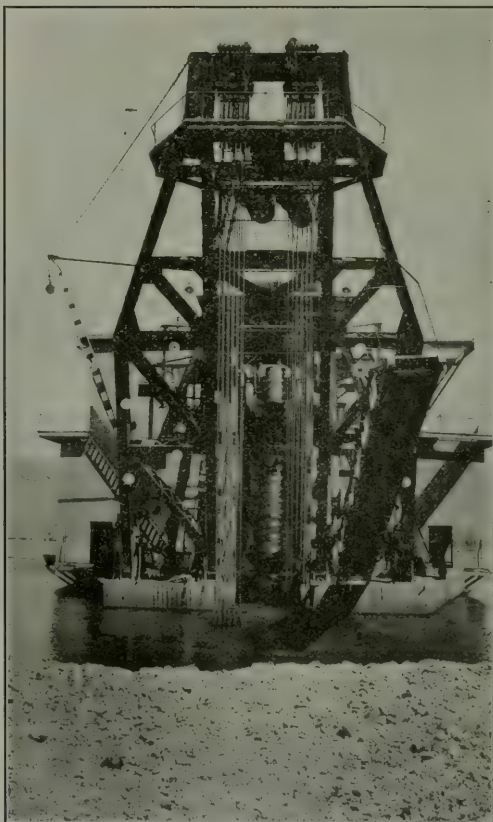


Photo No. 60. View of the bucket line of dredger No. 14 of the Yuba Consolidated Goldfields, 2 miles northeast of Hammonton.

The dredge buckets and screens are made of manganese steel, which gives twice the service of the old type made of carbon steel. The buckets cost about \$400 each, and their lips last from 9 to 12 months. The tailings conveyor belts last from 8 to 12 months and cost about \$11.00 per foot.



Photo No. 61. Dredgers Nos. 14 and 15 of the Yuba Consolidated Goldfields Company operating near Hammonton, Yuba County. September, 1916.



Photo No. 62. Dredger No. 15 of the Yuba Consolidated Goldfields Company, operating near Hammonton, Yuba County. The largest gold dredger in the world. September, 1916.

The Yuba Consolidated Goldfields Company is incorporated under the laws of the state of Maine. The officers are George L. Huntress, president; R. E. Paine, 50 Congress St., Boston, Mass., secretary-treasurer; W. P. Hammon, managing director; Newton Cleveland, Marysville, Cal., general manager.

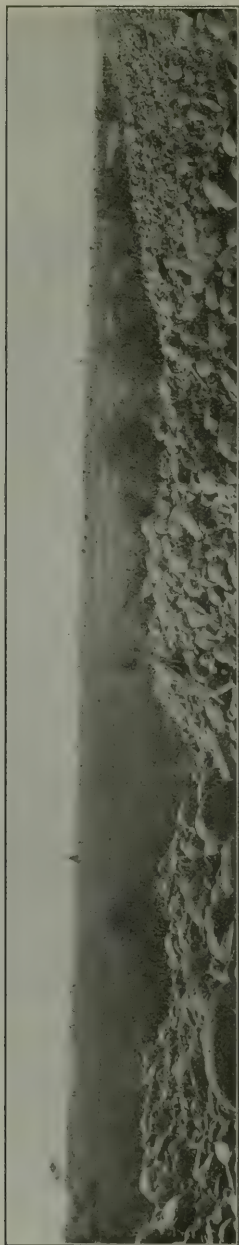


Photo No. 63. View westward towards Yuba dredgers (from right to left) Nos. 7, 8, 12 and 13 showing encroachment on agricultural land leaving boulder piles. In Sacramento and Butte counties such boulders are being crushed and sold for economic purposes.



Photo No. 64. View eastward up the Yuba River, just north of Marigold, showing abandoned settling basin and concrete outlet intended by the Government to prevent floods. The dredge tailings form very effective barriers for flood control. The proposed settling basin will probably be dredged by the Yuba Consolidated Goldfields Company.



Photo No. 65. Reclaiming gold dredge, of the Natomas Consolidated of California, at Natoma. The tailings stackers of this dredge deposit the cobbles underneath and spread the silt on top—just the reverse of the old type dredgers. Photo by Walter W. Bradley.

GOLD—DRIFT MINES.

Three drift mines were being worked in Yuba County, at the time visited. Prospectors occasionally do a little work in some of the old mines, searching for gold gravel, but only on a small scale.

The **Big Bend Blue Lead** mine, near Bangor, has a 2500' tunnel. The channel is said to be 100' wide and from 5' to 20' deep. The 1080 acres includes the old Catskill property near the old Grove, Bishop, Reifus and Turner properties, which are on the same channel and were worked through shafts. The channel is supposed to be a continuation of the one at Smartsville. Owned by F. F. Ford and C. G. Fowler, of San Francisco.

The **Boston Hill** or **Barton Mine**, formerly known as the **Never-sweat**, is located in Sec. 36, T. 20 N., R. 7 E., M. D. M., near Clipper Mills in the Strawberry Valley district. The deposit consists of coarse gravel, overlain by andesite. Two tunnels have been run, a lower one 900 feet long and an upper one 300 feet. Improvements consist of a shop and a bunkhouse. The channel is thought to be the same as that at the Kingbird mine. Owned by C. F. Adams and Walter Walker, of Clipper Mills, who are working the mine.

The **Old Pittsburg Drift Mine**, in Sec. 17, T. 19 N., R. 8 E., M. D. M., near Camptonville on the North Yuba River, is worked occasionally during the winter by prospectors. It has been abandoned by the owners.

Paul Ehmann and **Richard Cainne** were doing assessment work on the west side of Lone Tree Hill. Work done consists of a 150-foot incline shaft with drifts. The ore assays from \$1.50 to \$12.00 per ton.

The **Wheaton** or **Julius Cæsar Mine**, located in Sec. 29, T. 16 N., R. 6 E., M. D. M., 1 mile northwest of Smartsville, is on the old Blue

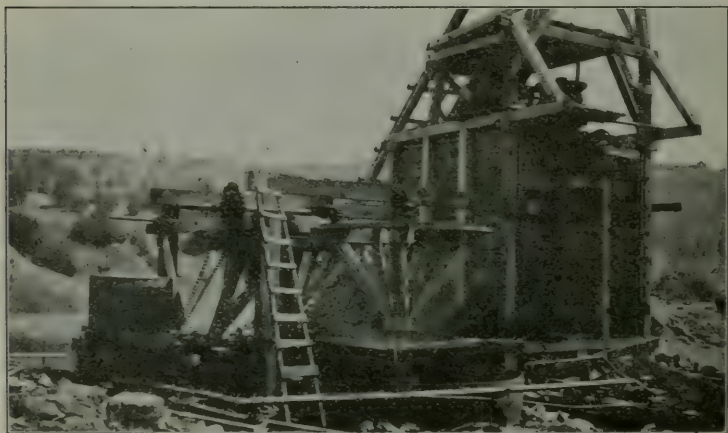


Photo No. 66. Hoist and arrastra run by water power at the Wheaton drift mine near Smartsville, Yuba County.

Gravel property, leased from the Excelsior Water and Mining Company by Mr. A. G. Wheaton and son, of Smartsville. The mine is on the south side of a ravine near Sucker Flat, at an elevation of 600 feet.

Development consists of a 120-foot 45° incline shaft and drifts. Development work was being carried on when visited, and it was stated to pay for itself. Twelve cubic yards of gravel per day are hoisted in a 17 cubic foot skip. Pay gravel averages \$1.50 per cubic yard. All work thus far has been carried on along the south rim. Three gravels are encountered: a soft, blue bedrock gravel averages about \$3.00 per yard; a hard cement pay dirt averaging about \$2.00 per yard; and a loose red gravel averaging about \$1.00 per yard.

Equipment consists of a hoist and two 12-foot arrastras run by waterpower. Water is obtained from the Excelsior Water and Mining Company, through an 8-inch pipe, at 10¢ per miner's inch.

GOLD—HYDRAULIC MINES.

No hydraulic mining is now carried on in Yuba County. Antidebris legislation is too exacting to permit small owners to operate, since the dams required would probably cost more than could be realized from working the gravels. Some of the more important old mines which might be placed on a producing basis are as follows:

The **Bean Boys Mine**, located in the SW. $\frac{1}{4}$ of Sec. 1, T. 19 N., R. 7 E., M. D. M., near Clipper Mills, Strawberry Valley district. Elevation 3450 feet. The gravels are from 10' to 12' deep in a branch of the North Fork of Yuba River. Water was obtained from Hampshire and Grizzly creeks. A log dam 50 feet long and 4 feet high, which was constructed to hold the debris, has been washed out. A 75-foot head is obtained for the water which is carried through a 7-inch pipe to a 1½-inch nozzle on a canvas hose. The owner, Mr. Rufus Bean, of Clipper Mills, intends to reconstruct the dam and finish working out the gravels.

The **Deer Creek, Enterprise, Pittsburg and Smartsville Consolidated** hydraulic mines near Smartsville are all now patented property and owned by the Excelsior Water and Mining Company, of Sacramento. They have not been worked, save by prospectors and pocket hunters, in recent years.

Bibl.: Register of Mines in Yuba County, 1905, State Min. Bur.

The **Golden Needle Mine**, located in Sec. 34, T. 19 N., R. 6 E., M. D. M., Brownsville district, is patented and owned by Messrs. Pierce, Chadbourne, Woods and Dobbys, of Brownsville. It is at an elevation of 2150 feet, and water is obtainable from the Forbestown ditch. The deposit consists of wash gravel carrying coarse gold. A log dam was built for holding the debris. Two nozzles can be used under an 80-foot head.

The **Horse Valley Mine**, in Secs. 34 and 35, T. 19 N., R. 8 E., M. D. M., near Camptonville, is controlled by a Mr. Leacher, from Pennsylvania. Elevation 2900 feet. Water is obtainable from Willow Creek. A tunnel has been run to obtain a grade for the sluice boxes. A cement debris dam is contemplated on Brandy Creek.

The **Kingbird Mine**, located on Sec. 36, T. 20 N., R. 7 E., in the Strawberry Valley district near Clipper Mills, is patented and owned by Messrs. E. H. Adams and R. Bean. Elevation 3800 feet. Water is obtained from Hampshire Creek. The old channel was 1,500 feet long and the loose gravel from 30 to 180 feet deep, has a bedrock of serpentine. A 14" pipe was used to supply the monitors. Considerable tunneling was done. Idle.

The **Nevada Mine**, located in Secs. 8 and 9, T. 18 N., R. 8 E., M. D. M., in the Camptonville district, is patented and owned by R. H. and R. W. Postlethwaite, of San Francisco. Elevation 2000 feet. The gravel is 15 feet deep, with a two-foot capping of andesite. A 3-mile ditch carried water from a tributary of the North Yuba River and supplied 4 giants under a 400-foot head. Idle.

The **New Blue Point Gravel Mine**, leased by the Tar Mining Company, is owned by P. Campbell Estate, of Smartsville, and located near



Photo No. 67. View of office, dredger and conveyor belt, also gravel slide which closed operations, at the property of the Tar Mining Company, Smartsville, Yuba County.

Sucker Flat one-half mile north of Smartsville. Elevation 600 feet. The company intended to hydraulic the gravel banks, use a dredger to catch the values, and stack the tailings with aerial trams. A large slide stopped operations, and it is thought that the values did not show up as expected.

Equipment consists of the following: one 8-inch and one 6-inch monitor to wash down gravels; 1500 feet of 36-inch pipe line; two large sectional hoists for boulders, made by the American Hoist and Derrick Company, St. Paul, Minn., capacity 30 tons each and run by electricity; Yuba Construction Company dredger with $7\frac{1}{2}$ -cubic-foot buckets; 2 1,500-foot aerial wire rope trams, built by A. Leachen & Sons Co., St. Louis, Mo.; office with concrete vault, draughting room, etc.

It is said that \$600,000 worth of stock was sold, a large portion of which was invested in equipment. Idle.

The **Railroad Hill** property in Sec. 36, T. 19 N., R. 8 E., M. D. M., is two miles NW. of Camptonville at an elevation of 2800 feet. The gravel is 30 feet deep, with no capping. Water is obtainable from French Creek by a 2-mile ditch. This old property is sluiced occasionally by prospectors.

The **Union Mine** in Secs. 22 and 23, T. 19 N., R. 6 E., M. D. M., of the Brownsville district, is owned by the Union Gravel Mining Company of Brownsville. Elevation 2300 feet. Forty-acre patent. Water obtained by a $\frac{1}{2}$ -mile ditch from a tributary of the Yuba River, furnished one monitor under a 60-foot head. Idle.

The **Weeds Point Mine** is located in the NE. $\frac{1}{4}$ of the NW. $\frac{1}{4}$ of Sec. 35, T. 19 N., R. 8 E., M. D. M., two miles northwest of Camptonville. It was reported that preparations were being made in October, 1915, to build a concrete restraining dam for tailings so that the mine might be hydraulicked.

The **York Mining Company** operated on New York House Flat, $1\frac{1}{2}$ miles west of Challenge, in Sec. 25, T. 19 N., R. 6 E., M. D. M. About 7 acres were hydraulicked and the property is said to be worked out. Idle. Owned by Mulberry Foss, Forbestown, Butte County, Cal.

GOLD—PLACER MINES (Surficial or Sluicing).

Considerable placer mining is carried on along the streams and ravines of Yuba County, particularly during the spring months. Following are the names of properties and parties operating in the fall of 1915.

The **Alcalde Placer** is in the bed of Yuba River about 8 miles northeast of Browns Valley. It is owned by W. R. Hendricks, of Browns Valley, and worked by B. A. Schubert, who took out about \$150.00 in the summer of 1914.

The **Archimedes Placer** in the N. $\frac{1}{2}$ of N. $\frac{1}{2}$ of T. 16 N., R. 6 E., M. D. M., near Smartsville, is owned by E. A. Forbes, of Browns Valley. The property consists of a river claim in hydraulic tailings, worked with sluice boxes.

The **Boston Consolidated** which is owned by L. F. Pratt, George Hardy, Chas. Mason et al., includes the Boston Boys claim and others along the Yuba River northeast of Browns Valley.

The **Bright Star** is a river claim in the bed of Yuba River near Parks Bar Bridge in Sec. 20, T. 16 N., R. 6 E., M. D. M. Elevation 200 feet. Owned by W. J. Forbes, of Browns Valley, and J. E. Ebert, of Marysville. Sluice boxes are used. Reported sold to the Pacific Gold Dredging Co., in 1916.

The **George** placer is in Sec. 17, T. 18 N., R. 7 E., M. D. M., 3 miles north of Dobbins. The placer is on a 160-acre patent, at an elevation of 2250 feet. The ground is sluiced in a deep ravine, a branch of Labadie Creek, during the rainy season. The loose gravel varies from 2 feet to 20 feet in depth. The bedrock is rough and the gold is coarse. The large boulders are piled along the center of the ravine. Owned by M. E. George, of Dobbins, who works the deposit in the winter time.

The **Industry Bar** placer lies 10 miles northeast of Browns Valley and $2\frac{1}{2}$ miles above the Alcalde Placer. It is just above the mouth of Keystone Ravine on the south side of Yuba River. The river bed is worked every summer.

The **Landers Bar** placer adjoins the Alcalde placer to the south and lies 7 miles northeast of Browns Valley, just above the narrows of Yuba River. It adjoins the property of the Pacific Dredging Company to the south and includes the full width of the river. The gravels are from 30' to 40' deep, including an overburden of hydraulic tailings. Owned by B. A. Schubert, of Browns Valley.

Placering in gravels west of **Smartsville** is being carried on by Mr. Spencer and others of Smartsville.

Idle placers follow:

Fillmore Hill, SE. $\frac{1}{2}$ of SW. $\frac{1}{4}$ of Sec. 29, T. 16 N., R. 6 E., M. D. M., near Smartsville. Owned by the S. O. Gunning Estate, of Marysville.

Forbes, in Secs. 8, 10, 11, 14, 15, 16 and 17, T. 16 N., R. 6 E., M. D. M., near Smartsville, owned by E. A. Forbes, of Browns Valley.

Golden Gate, in SW. $\frac{1}{4}$ of NE. $\frac{1}{4}$ of Sec. 34, T. 16 N., R. 6 E., one mile south of Smartsville, owned by the Excelsior Water and Mining Co.

Lone Cedar, in Sec. 4, T. 17 N., R. 6 E., M. D. M., near Oregon House.

Lone Jack, in Sec. 16, T. 16 N., R. 5 E., M. D. M., near Browns Valley.

Joe Losey, in SE. $\frac{1}{4}$ of NE. $\frac{1}{4}$ of Sec. 19, T. 16 N., R. 6 E., near Browns Valley. Forty-acre patent. Raised benches above the Yuba River. Gravel 4 feet to 100 feet. One-quarter mile back from river on the hillside. Owned by Joe Losey.

Montclair in the W. $\frac{1}{2}$ of the SW. $\frac{1}{4}$ of Sec. 21, T. 16 N., R. 6 E., M. D. M., $1\frac{1}{2}$ miles NW. of Smartsville in the bed of Yuba River. Idle.

Mosquito, 6 miles SE. of Brownsville in the Dobbins district. Prospected only by the owners, C. E. Morey and John Nelson, of Dobbins.

GOLD—QUARTZ MINES.

The quartz veins of Yuba County have yielded many rich pockets of free gold and have furnished the gold which is now being placered and dredged in the river channels. The county offers considerable opportunity for prospectors and pocket hunters, and certain groups of veins could no doubt be worked profitably and milled. Since the presence of considerable copper with the ores makes cyaniding unprofitable, some flotation system would seem more feasible.

Abbot Mine. Brownsville district. In SW. $\frac{1}{4}$ of Sec. 8, T. 18 N., R. 6 E., M. D. M., at Rackerby. Elevation 1430 feet. Patented 159 acres. Three-foot quartz vein, carrying 5% sulphurets, at granite-porphry contact. Strike W. 40° E. Dip 70° NW. a 65-foot 2-compartment shaft follows the vein from the surface. Equipped with old head frame. About 100 tons are reported to have been taken out and milled at the Santa Rosa mine. The ore milled about \$5.00 per ton. Mine has not been worked since 1906. Owned by N. B. Abbott, of Rackerby.

Albion King Mine. Smartsville district. One-half mile NW. of Waldo in Sec. 33, T. 15 N., R. 6 E., M. D. M. Elevation 500 feet. Patented. Two-foot quartz vein along contact of porphyry with slate. Strike N. 45° W. Dip 45° W. Open cut 40 feet. Idle for three years. Owned by Wm. B. Ross, of Waldo.

Arbucco Mine. Brownsville district, $1\frac{1}{2}$ miles NE. of Challenge in Sec. 16, T. 19 N., R. 7 E., M. D. M., on road from Woodleaf to the Mt. Hope Mine. Patented. Elevation 3000 feet. Three-foot vein of ribbon quartz at contact of serpentine with granite. Strike N. 30° E. Dip 45° N. Workings caved. Idle for years.

B. A. C. Mine. Brownsville district. One mile north of Brownsville in Sec. 26, T. 19 N., R. 6 E., M. D. M. Elevation 2600 feet. Patented 224 acres, with a good stand of pine, fir, spruce and cedar. Water is obtainable from the South Feather Ditch Company, but the mine makes enough water for present operations. Four-foot quartz vein, with free gold and pyrite, in diabase. Strike N.-S. Dip 41° E. Two hundred and fifty-foot incline shaft. Six hundred feet of N.-S., drifting on 110-foot level. Hand drilling. Steam power. Wood costs \$2.25 per cord. Equipment consists of hoist, jaw crusher, 5-stamp mill with 12-mesh screens, ball-mill, amalgamation tank, two 3-foot diameter x 10-foot depth agitating tanks and zinc precipitating cones.

The cyanide plant was being installed when visited in August, 1915. When operating it was expected to employ about 20 men in the mine and 10 men on the surface in 3 shifts. Miners receive \$3.00 per day.

The ore is said to average \$12.00 per ton. Operations reported to have closed down in October, 1915, to develop more ore.

Owned by J. H. Batcher, W. S. Graham, B. F. Hartley and Mrs. B. A. Campbell, who are called W. S. Graham and Co., with home office at Brownsville. J. C. Campbell, mine superintendent.

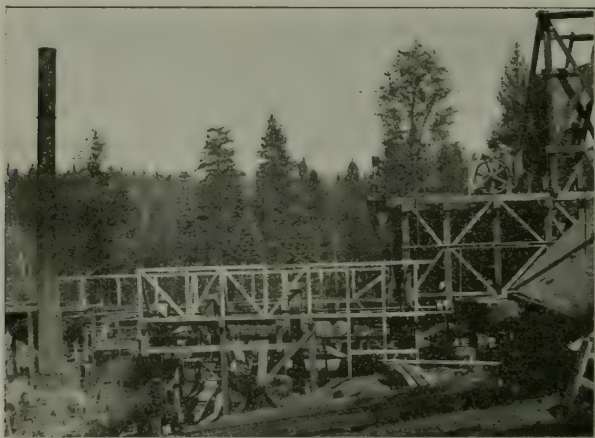


Photo No. 68. View northward of the mill and cyanide plant of the B. A. C. mine at Brownsville, Yuba County.

Beehive or Mount Hope Mine. Brownsville or Mount Hope district. Sec. 8, T. 19 N., R. 7 E., M. D. M., two miles south of Woodleaf on main road from Woodleaf to Oroville. Elevation 3050 feet. Four claims, one of which is patented. Eighty acres. Four-foot to 6-foot vein of ribbon quartz, carrying pyrite, along contacts of quartz diorite and schist. Strike N. 80° E.; dip 45° E.; 200-foot incline shaft; 150 feet of drifting on the 100-foot level. New 400-foot tunnel being run for drainage is now 300 feet long. Hand labor, steam hoist and air compressor; 4-foot wood for fuel costs about \$3.50 per tier. Mill includes eight 750-lb. stamps, 2 amalgamation tables and one Frue concentrator.

When visited in September, 1915, the incline shaft was caved at a depth of 20 feet, and some work had recently been done to open it up. The machinery was in fair condition, but the buildings were beginning to go to pieces. Owned by Mrs. M. A. G. Blake, of Oakland. Leased on May 15, 1914, to J. D. Johnston, of Newport, Rhode Island, and David T. Graham, of Glendale, Los Angeles County, Cal.

Bibl.: Rep. XIII, p. 501; XII, p. 317.

Beaver, Union, Cassa or Golden Mary Mine. Brownsville district. W. $\frac{1}{2}$ of Sec. 34, T. 19 N., R. 6 E., M. D. M., $1\frac{1}{2}$ miles southwest of Brownsville. Elevation 2450 feet. Claims: Golden Ribbon, G. R. South Extension, G. R. North Extension, Big Oak, Big Oak North Extension, Grey Bonnet, Grey Bonnet North Extension, Grey Bonnet North Fraction. A 6-foot quartz ledge carrying pyrite and chalcopyrite at contact of granite and porphyry. Strike N. 15° W.; dip 38° W.; 170-foot incline shaft. Drifts: N. 165' on 100-foot level; SW. 114' and S. 100' on 100-foot level; 83' N. on 133-foot level. About 80 feet of cross-cutting has been done on the surface. Hand drilling. Ore hoisted in bucket drawn by 40 h. p. Standard Distillate engine. One Joshua Hendy crusher, one 5-foot Huntington mill, with 16-inch rolls and one 4-foot x 10-foot amalgamation table. Two miners and a hoistman employed. The tailings are turned into a small creek near by. There is considerable pine, fir, spruce and cedar on the property. Water is obtained from the Forbestown Ditch at \$0.10 per miner's inch. Owned by C. C. Beaver, of Browns Valley. Leased by the Cassa Gold Mining Co., of which Mr. McAnnini is president, and George Gale, 423 Coe Building, San Francisco, secretary-treasurer. Mr. W. A. Saunders, of Oakland, is superintendent.

Bibl.: Rep. XIII, p. 500, 1896.

Bessie Mine. Browns Valley district. One-half mile north of Browns Valley in Sec. 16, T. 16 N., R. 5 E., M. D. M. Elevation 270 feet. Patented. A 3-foot quartz vein carried some free gold in places. Strike N.-S.; dip 35° W.; 40-foot incline shaft; 100 feet of drifting. Owners hoped to run into Flag vein towards which the Bessie vein was thought to dip. Assessment work only. Owned by Byron Burris, of Browns Valley.

Bismark Prospect. Smartsville district. One-half mile south of Waldo in Sec. 33, T. 15 N., R. 6 E., M. D. M. Elevation 400 feet. Patented. Tunnel 550 feet. Greatest vertical depth 200 feet. Work was discontinued before the ledge was struck. Idle for 15 years. The ore shows a few colors by panning.

Black Maria. Smartsville district. SE. corner of Sec. 20, T. 16 N., R. 6 E., M. D. M., 2 miles northwest of Smartsville. Patented. Elevation 350 feet. Eighteen inch quartz vein in slate. Strike N. 20° W.; dip 40° SW.; 40-foot shaft; 175 feet of drifts. Idle. Owned by S. O. Gunning Estate, Marysville, Cal.

Boa Prospect. Smartsville district, 2 miles northwest of Smartsville, in Sec. 29, T. 16 N., R. 6 E., M. D. M. Elevation 650 feet. Four-foot quartz vein in slate carries sulphurets. Strike N. 45° W.; dip 50° SW.; 100-foot shaft. Idle for seven years. Abandoned by M. C. Meeker, of Camp Meeker, Sonoma County, Cal.

Bibl.: Rep. XIII, p. 499.

Bullard's Bar Prospect. Dobbins district. Six miles northwest of Dobbins in NW. $\frac{1}{4}$ of Sec. 13, T. 18 N., R. 7 E., M. D. M. Elevation 1900 feet. Patented. Eighty-five-foot quartz vein at contact of granite and slate. Strike N.-S.; dip 45° E.; shaft 15 feet; tunnel 155 feet. Owned by George A. Mix, of Bullard's Bar, and bonded to C. L. Crane. Idle.

Burns Prospect. Smartsville district. Three-quarters of a mile northeast of Smartsville. Elevation 500 feet. Three-foot quartz vein in slate. Strike NW.-SE.; dip NE.; 50-foot shaft; 200-foot tunnel. Assessment work only. Owned by J. Burns, of Smartsville.

Bibl.: Rep. XIII, p. 499.

California Mother Lode or Eagle Gold Mine. Indiana ranch district, 32 miles northeast of Marysville; 2 miles northwest of Dobbins.



Photo No. 69. New work on the Mother Lode vein at Indiana Ranch, near Dobbins, Yuba County, California.

Elevation 1860 feet. Twelve claims, including the Eagle Gold, Delaware and Frisco Fraction. Two hundred and forty acres. The Mother Lode vein averages about 3 feet in width and can be traced on the surface for about a mile, along a slate-diorite contact. It has several parallel stringers, and strikes N.-S., with a dip of about 65° to the east. The ore carries free gold, pyrite, arsenopyrite, chalcopyrite and tellurides.

The old workings, where most of the work has been done, were idle when visited in August, 1915. The equipment consisted of electric hoist, 10-stamp mill and tube mill. The old shaft is 300' deep and has five levels at 65', 100', 140', 200' and 300'. The tailings are impounded.

A new 60-foot vertical shaft with 160-foot drift to the south was being worked near Indiana Creek when visited. Six men were employed, 2 on the surface and 4, in two 8-hour shifts, underground. A 20-foot hoist, with 20 h. p. motor, air compressor and one air drill were being used. Miners received \$3.50 and did about 4 feet of development work per day. The new workings make about 75 inches of water. Power is furnished by the Colgate line, and costs about \$.06 per k. w. h. The ore is hauled to Marysville by a 3-ton Packard truck. Considerable pine, fir, cedar and spruce grow on the property. Owned by the California Mother Lode Mining Co., of San Francisco; president and manager, W. C. Wilkins; treasurer, C. S. Brooks; mine superintendent, F. L. McPherson, Dobbins, Yuba County, Cal.

Chandler Mine. Brown's Valley district. Two miles south of Browns Valley in Sec. 22, T. 16 N., R. 5 E., M. D. M. Elevation 200 feet. Patented 160 acres; 30 feet of vertical shaft. A rich pocket was worked out with horse whim about 30 years ago. Idle. Owned by August Eymard, of Browns Valley.

Cleopatra Prospect. Smartsville district. In Secs. 28 and 29, T. 16 N., R. 6 E., M. D. M., one mile northwest of Smartsville. Elevation 550 feet. Patented in 1914. A 4-foot quartz vein, in diorite, carries free gold. Vein strikes N. 45° W. and dips 45° SW.; 45-foot shaft. Idle. Owned by Chas. F. Ayer, Boston, Mass.

Conwell Prospect. Indiana ranch district. Sec. 23, T. 18 N., R. 7 E., M. D. M., 4 miles northeast of Dobbins. Adjoins the Summit Hill mine to the north; 90-foot incline shaft. Idle for 30 years.

Dakota Prospect. Brownsville district. One and one-half miles northwest of Brownsville. Idle for 20 years. Property now homesteaded by C. C. Beaver.

Dannebrog Group. Browns Valley district. In Sec. 16, T. 16 N., R. 5 E., M. D. M., at Brown's Valley. Elevation 250 feet. Patented. Thirty-inch quartz vein carrying free gold, pyrite and chalcopyrite in diabase, strikes N. 35° W.; 900-foot incline shaft on vein; 1000 feet of drifting. Idle for 20 years. Owned, together with the adjoining, idle, Hawkeye and Pennsylvania mines, by the Rideout Bank, of Marysville.

The Hawkeye is opened up by 25', 40' and 50' shafts with 200' of drifting, and showed an 18" to 2' vein of free milling quartz; about 400 tons were milled in the Pennsylvania mill.

The Pennsylvania Mine has a 180-foot shaft near the old mill. Three ledges are said to have been followed in a 100-foot fissure. Equipment consists of a ten-stamp mill and one Baer Mill. Idle for three years. The ore is said to have run from \$7.00 to \$500 per ton. The property was turned over to the Rideout Bank by F. W. Johnson, of Marysville.

It is thought, by the owners, that the property could be worked at a profit under good management.

Bibl.: Rep. XIII, pp. 499-500, 1896.

Deadwood or Miller Prospect. Brownsville district. Sees. 15 and 16, T. 19 N., R. 6 E., M. D. M. Three miles NW. of Brownsville. Elevation 2660 feet. A 5-foot quartz vein. Strike NE.-SW.; dip SE. Several shallow shafts. Idle. Owned by C. W. Roberts and Mr. Frye, of Forbestown, Butte County.

Easy Money Prospect. Brownsville district. In Sec. 19, T. 19 N., R. 7 E., M. D. M. One mile northwest of Challenge. Elevation 2600 feet. Quartz vein strikes N. 25° W. and dips 70° W. Three hundred and fifty-foot tunnel being driven to drain 40-foot shaft. All hand labor by leasers. The 350-foot tunnel cut a 5-foot quartz ledge at 310 feet. On land of Southern Pacific railroad company. Two claims, the Easy Money and Easy Money Extension; owned by Mr. Harvey, of Brownsville. Work being done for one-half interest by F. Foster and T. Reis, of Challenge.

Eich Prospect. Indiana ranch district, near Oregon House. Eight-inch quartz vein. Strike N.-S. Dip 50° W. Outcrops on surface for 300 feet; 10-foot shaft. Hand labor with windlass. Patented 680 acres. Owned by Mrs. Kate Eich and two sons, A. J. and H. D. Eich, of Oregon House.

Fairview Prospect. Browns Valley district. Sec. 9, T. 16 N., R. 5 E., M. D. M., one mile northwest of Browns Valley. Elevation 350 feet. Three-foot quartz vein, in porphyry, carrying free gold. Strike N.-S. Dip 45° W.; 35-foot shaft; 30-foot drift. Idle for several years. Owned by Whittier and Stevens, of Browns Valley.

Garbet Prospect. Brownsville district. East of Santa Rosa Mine and northeast of Rackerby. A 2-foot quartz ledge. Ore said to have milled \$6.00 per ton. Owned by Mr. Garbet, of Rackerby.

George Prospect. Indiana ranch district. Sec. 17, T. 18 N., R. 7 E., M. D. M., three miles north of Indiana Ranch. Elevation 2250 feet. Patented 160 acres. Pine, spruce, and cedar on property. A 30-inch quartz vein, in granite, carrying free gold and pyrite. Strike NE.-SW.; dip 45° E. Shaft 14-foot. Hand labor. Owned by M. E. George, of Dobbins.

Golden Key. Brownsville district. In SW. cor. Sec. 33, T. 19 N., R. 6 E., M. D. M., 1½ miles NE. of Rackerby. Elevation 2300 feet. Patented. A 2-foot quartz vein at diorite-porphyry contact. Strike E.-W.; dip vertical; 60-foot open cut; 30-foot and 50-foot shafts. Idle for over 14 years. Owned by W. J. Mellon, of Challenge. Leased to G. S. Peyton, of the Santa Rosa Mine.

Good Hope. Smartsville district. Sec. 34, T. 15 N., R. 6 E., M. D. M., $\frac{3}{4}$ mile southeast of Waldo. Elevation 400 feet. An 18-inch quartz vein along slate-porphry contact. Strike N. 45° W.; dip 45° SW.; 150-foot shaft. Old four-stamp mill. Idle. Owned by Mrs. Eva C. Sanford, of Waldo.

Good Title or Templar No. 1. Indiana ranch district. NW. corner of Sec. 20, T. 18 N., R. 7 E., M. D. M., 3 miles northwest of Dobbins. Elevation 2150 feet. Patented. A 30-inch quartz vein carrying 1% sulphurets. Old workings caved. Seven hundred-foot lower tunnel open and being worked by Mr. Williams and two sons. Hand labor. Water power in winter and 8 h. p. gas engine in summer. Mill with two 275-pound stamps, built by Union Iron Works, has a capacity of 3 tons in 24 hours. Cyanide tank with one ton capacity every six days. Owned by T. J. Williams and two sons and sister-in-law, of Dobbins.

Hansonville Mine. Brownsville district. Secs. 5 and 8, T. 18 N., R. 6 E., M. D. M., $\frac{1}{4}$ mile east of Rackerby. Patented. A 3-foot quartz vein, carrying 3% sulphurets, along contact of serpentine and porphyry; 220-foot shaft; 40-foot incline, 475-foot drift. Idle. Owned by Mrs. Pierce, of Brownsville; L. A. Wyman, of Boston, Mass., agent.

Hibbert and Burris. Browns Valley district. In Sec. 16, T. 16 N., R. 5 E., M. D. M., $\frac{1}{4}$ mile northwest of Browns Valley. Patented. A 4-foot quartz vein in diorite. Strike E.-W.; dip 40° N.; 170-foot shaft; 360-foot tunnel. Idle. Owned by B. Burris and Mrs. E. Hibbert, of Browns Valley.

Higgins or Elk Prospect. Dobbins district. In Sec. 19, T. 18 N., R. 7 E., M. D. M. Elevation 2300 feet. The 5-stamp mill stood near the California Mother Lode tailings pile and has not worked for 20 years. A pockety quartz vein varying from 1' to 9' in width has a strike NE.-SW., and dipped nearly vertical. Owned by the Elk Gold Mining Co., but reported to have been relocated by S. Bishop and F. L. McPherson, of Dobbins.

Hillside Prospect. Dobbins district. Sec. 23, T. 18 N., R. 7 E., M. D. M. Four miles northeast of Dobbins. Elevation 2750 feet. Patented. An 18" to 2' quartz vein, carrying pyrite and chalcopyrite. Strike N. 45° W.; dip vertical; 60-foot incline shaft. Idle for 6 years. Owned by R. L. Hill, Jr., 1169 Broadway, Oakland, Cal.

Horseshoe. Brownsville district. SW. cor. Sec. 21, T. 19 N., R. 7 E., M. D. M., $1\frac{1}{2}$ miles northeast of Challenge. Elevation 3200 feet. Patented. Eighteen-inch vein of ribbon quartz, carrying free gold, in schist. Strike N.-S.; dip 75° W.; 90-foot shaft and 450-foot drainage tunnel. Pine, fir, and cedar on property furnish fuel at \$3.50 per tier. Equipment consists of a Joshua Hendy boiler, Ingersol-Rand air compressor, one $2\frac{3}{4}$ inch cylinder Ingersol-Rand butterfly drill. Seventy-

five pounds air pressure is used. Three men employed. Owned by Fred C. Clemens and Mrs. Addie Clemens, of Challenge, and Joseph Supple, of Oregon.

Jefferson Mine. Browns Valley district. SE. cor. Sec. 16, T. 16 N., R. 5 E., M. D. M., $\frac{1}{4}$ mile south of Browns Valley. Elevation 250 feet. Patented. A 12-foot quartz vein in diabase. Strike N. 10° W.; dip 45° E.; 800-foot incline; 1500 feet of drifting. Said to have paid \$3,000,000 in dividends down to the 600-foot level. Idle. Owned by F. W. Johnson, of Marysville.

Bibl.: Reps. XIII, p. 501; XII, p. 321.

Last Chance or Dexter. Browns Valley district. In Sec. 16, T. 16 N., R. 5 E., M. D. M., $\frac{3}{4}$ mile NW. of Browns Valley. Elevation 320 feet. A 6" to 2' quartz vein, carrying free gold and sulphides, along diorite-porphry contact. Strike N.-S.; dip 45° W.; 90-foot shaft. Mill with five 800 lb. stamps run by 20 h. p. gas engine. Owned by Chas. Yates et al., of Marysville.

Leal Prospect. Brownsville district. In Sec. 26, T. 19 N., R. 6 E., M. D. M., $\frac{1}{2}$ mile west of north of Brownsville, near the Leal sawmill. Elevation 2500 feet. Patented 120 acres. Quartz vein 200 ft. long in diabase carries sulphides; 20-foot shaft on a pocket from which it is said \$2,000.00 has been taken out. Owned by M. Leal, of Brownsville.

Lillian Francis or Scott Mine. Indiana ranch district. Sec. 30, T. 18 N., R. 7 E., M. D. M. Elevation 1700 feet. Patented 156 acres. Two quartz veins, called the Scott and South Scott, lie along the contact between serpentine and porphyry and vary from 18 inches to 30 inches wide. Strike N.-S.; dip vertical. Hoist run by 8 h. p. gas engine. Pump run by 20 h. p. steam engine. Two-stamp mill run by 20 h. p. gas engine. Tailings impounded.

Assays of the ore are as follows:

1 -----	Gold, \$10 50	Silver, \$0 05
2 -----	Gold, 8 06	Silver, 10
3 -----	Gold, 2 88	Silver, 13
<hr/>		
Average -----	Gold, \$7 15	Silver, \$0 09

The veins are said to have been very rich near the surface from erosional concentration and the ravines have all been placered.

Costs are as follows:

Wood delivered-----	\$3 50 per cord
Distillate-----	14 per gallon
Freight from Honcut-----	40 per hundred
Freight from Marysville-----	50 per hundred
Mining timber delivered-----	05 per foot
Lagging delivered-----	5 00 per M.

Miners demand \$3.00 per day of 8 hours.

The Pacific Gas and Electric Co's plant at Colgate furnishes the region with power. Water is obtained from a creek on the property and there is a sparse stand of pine and oak trees. Owned by Mr. Chester Merriam, of Dobbins.

Little Kingbird. Strawberry Valley district. Sec. 36, T. 20 N., R. 7 E., M. D. M. One mile northeast of Clipper Mills. Elevation 3850 feet. Patented 680 acres. A 12-inch quartz vein, carrying sulphides, in amphibolite. Strike NW.-SE.; dip 50° NE.; 125-foot incline shaft; 400-foot tunnel; 50-foot drift at end of tunnel. Development is said to have cost \$2.50 per foot. Yellow and sugar pine, fir, spruce and cedar cover the property. Water is obtainable from a tributary of Grizzly Creek.

About one mile east of the Little Kingbird is the so-called *Big Ledge*, or *Kingbird*, prospect. A 16-foot shaft has been sunk in a 20-foot solid quartz ledge which strikes N. 70° E. The quartz carries a very small amount of sulphide but looks rather barren. Owned by the Little Kingbird Mining Co., of Clipper Mills. Those interested are Parish and Rufus Bean, of Clipper Mills, W. J. Mellon, of Challenge, J. E. Ebert, of Marysville, and a Los Angeles party.

Lone Tree. Smartsville district. In Sec. 20, T. 15 N., R. 6 E., M. D. M., 4 miles northwest of Waldo. Elevation 650 feet. Patented 80 acres. An 18-inch quartz vein, carrying free gold, in slate. Strike N. 40° W.; dip vertical; 100-foot incline shaft. Hand drilling. Horse whim. Intended to install a 5-stamp mill with 20 h. p. gas engine; 4 men employed. Development work mostly on a new incline shaft, 200 feet below the old shaft of Jack Stevens. Assays of the ore ran between \$10.00 and \$29.00 per ton. Owned by F. Ayer, of Smartsville. Leased by H. L. and C. F. Johnson, H. L. Hite and C. E. Kibbie, of Waldo.

Lucan Prospect. Brownsville district. East of Rackerby. A 200-foot shaft and four 10-foot prospect pits. Idle. Owned by W. H. Carlin, of Rackerby.

Manwaring Prospect. Smartsville district. Sec. 33, T. 15 N., R. 6 E., M. D. M. Considerable drifting. Idle.

Manzanita or Abbie Mine. Brownsville district. Sec. 28, T. 19 N., R. 6 E., M. D. M., three miles west of Brownsville. Elevation 2400 feet. An 8-foot quartz porphyry vein along contact of diorite and slate. Strike E.-W.; dip 45° N.; 300-foot shaft; 60-foot tunnel; 195 feet of drifts. It is reported that a new hoist is being installed. Owned by Boston parties. Mr. Young, of Brownsville, superintendent.

The **Marc Anthony Gold and Silver Mine** belongs to the same group as the Black Maria. Located in Secs. 20 and 28, T. 16 N., R. 6 E., M. D. M., $\frac{3}{4}$ mile north of Timbuctoo. A 6-foot quartz vein in slate; 195-foot incline; 30-foot tunnel; 225 feet of drifts. Idle for 3 years.

Napa and Oro. Brownsville district. Sec. 16, T. 19 N., R. 6 E., M. D. M., 4 miles northwest of Brownsville. Property corners on road from Forbestown to Oroville. Elevation 3000+ feet. An 8-foot quartz vein in porphyry. Strike N.-S.; dip 45° W.; 45-foot shaft. Water from Forbestown ditch. Pine trees on property. Owned by B. D. Dobbys, of Brownsville, and P. S. King and W. Collins, of Napa.

Nineteen Hundred and One. Browns Valley district. Sec. 16, T. 16 N., R. 5 E., M. D. M. One mile north of Brown's Valley. Elevation 260 feet. Patented. Two 3-foot quartz veins in diabase. Strike N.-S.; dip 45° E.; 40-foot shaft. Idle. Owned by E. F. Forbes, of Marysville, and B. Burris, of Browns Valley.

Northern Light. Brown's Valley district. Sec. 16, T. 16 N., R. 5 E., M. D. M., $\frac{1}{2}$ mile north of Browns Valley. Elevation 250 feet. Patented. A 3-foot quartz vein in slate. Strike N.-S.; dip 40° E.; 35-foot shaft. Idle. Owned by Mrs. Ella Porter, of Browns Valley.

North Star or Eagleville Mine. Strawberry Valley district. In Secs. 20 and 21, T. 20 N., R. 8 E., M. D. M., two miles northeast of Strawberry Valley. Elevation 3700 feet. Patented. There are 10 narrow quartz stringers, from 2" to 18" wide, in slate and granite. Strike N. 47° E.; dip from 65° to 87° SE.; 150-foot vertical shaft; 250-foot south drift and 400-foot north drift. Hand labor. Equipment consists of steam boiler, one 2-stamp Gates improved mill, 16-foot amalgamation table and 12-foot concentrating table. Ore is said to have milled \$6.00 per ton. Sulphides stored. Idle. Owned by G. W. Lund, of Willows, Nora I. Haines, of Oakland, and Richard Schumann.

Nugget and Coronado Mining and Milling Co. Smartsville district. Sec. 20, T. 16 N., R. 6 E., M. D. M., 2 miles northwest of Smartsville. Elevation 300 feet. A 4-foot vein of free milling quartz along contact of slate and granite. Strike N. 45° W.; dip 45° W.; 80-foot incline shaft. Unpatented. Abandoned.

Ora Lewa. Brownsville district. In Sec. 7, T. 18 N., R. 6 E., M. D. M., one mile west of Rackerby. Elevation 2100 feet; patented; 178 acres. There are 10 small pockety quartz stringers striking both E.-W. and N.-S. in porphyry along granite contact. Dip 45° S. and E. 73-foot shaft and 60-foot drift caved. Owned by J. E. Ebert, of Marysville, and W. J. Mellon, of Challenge.

Peerless Mining Co. Smartsville district. In Sec. 28, T. 16 N., R. 6 E., M. D. M., one mile northwest of Smartsville. Elevation 340 feet. Unpatented. A 6-foot quartz vein, carrying sulphurets, along diorite-slate contact. Strike N. 45° W.; dip 40° S.; 140-foot incline; 250-foot tunnel. Assessment work only. James Byrne, manager, Smartsville, California.

Rattlesnake. Browns Valley district. Sec. 9, T. 16 N., R. 5 E., M. D. M., one mile north of Browns Valley. Elevation 260 feet. Patented. An 18-inch vein of free milling quartz in diorite. Strike E.-W.; dip 40° N.; 300-foot incline shaft; 500 feet of drifts. No equipment. Idle. Owned by Mr. George Smithurst, of Browns Valley.

Bibl.: Rep. XIII, p. 502.

R. C. Mine. Brownsville district. In Sec. 26, T. 19 N., R. 6 E., M. D. M., $\frac{1}{4}$ mile east of Brownsville, near main stage road to Woodleaf. Elevation 2200 feet. Patented. A 4-foot quartz vein along diorite-slate contact. Strike N.-S.; dip 45° E.; 137-foot shaft; 800-foot tunnel. Waterpower available. Part of B. A. C. property. Bonded by W. S. Graham and Co., of Brownsville.

Red Cross Gold Mine. Dobbins district. Sec. 29, T. 18 N., R. 7 E., M. D. M., one mile north of Dobbins. Elevation 1950 feet; 8 claims and a fraction of which 2 claims are patented; 40 acres. Pine, fir and cedar on property. Two blanket veins of decomposed quartz, from 8" to 18" thick, lie 20' and 40' below the surface. Strike N. 70° W. and dip 70°. Old shallow tunnels caved; 40-foot new shaft and sinking. Hand windlass; 2½ h. p. gas engine runs pump. Water level at 30 feet below surface. Handpicking; no blasting required. Ore said to run from \$20.00 to \$50.00 per ton. Prospecting is said to have been carried on for 5 months. Two men employed at \$3.00 per day. Owned by Red Cross Gold Mining Company, R. E. Brannan, president, Gladstone Hotel, Chicago; J. C. Merriam, vice-president, Dobbins; Patrick Brannan, secretary, Marysville; John J. Wyatt, managing director, Dobbins.

Red Ravine Mine. Dobbins district. Sec. 30, T. 18 N., R. 7 E., M. D. M., two miles northwest of Dobbins. Elevation 1750 feet. Pine, fir, cedar and oak trees on property. Water available in Indiana Creek. An 18-inch quartz vein, carrying free gold and sulphides with sylvanite, along a diorite-porphry contact. Strike N.-S.; dip 80° E.; 90-foot shaft; 100-foot north drift; 75-foot south drift. "O. and S." steam engine, which runs a No. 1 Garden City fan and a pump. A 2-stamp mill and old Frue concentrator. It is said that \$65,000 was taken from the main shaft at a depth of 35 feet. Owned by the Red Ravine Mining Company, of Marysville, which levied an assessment of \$.002 per

share in July, 1916, for development purposes. Harry Bell, president, Dobbins; H. A. Geach, secretary, Marysville.

Rogers Mine. Brownsville district. Sec. 6, T. 18 N., R. 6 E., M. D. M., one mile northwest of Rackerby. Elevation 1500 feet. Pine and oak trees on property. Water from Honcut Creek or the Forbestown ditch. Patented 227 acres. An 18-inch quartz ledge carrying free gold with chalcopyrite along slate-porphry contact. Strike N. 45° E.; dip 30° S.; 150-foot tunnel which follows the ledge for 50 feet. A 3-stamp mill run by water from Honcut Creek. Idle. Owned by Mr. John Rogers, of Rackerby.

Santa Rosa Mine. Brownsville district. Sec. 5, T. 18 N., R. 6 E., M. D. M., $\frac{1}{2}$ mile north of Rackerby. Elevation 1770 feet. Patented. Three-foot quartz vein in slate. Strike E.-W.; dip vertical; 475-foot tunnel. Equipment consists of five 700-lb. stamps, one 5' x 12' amalgamation table and 2 Frue concentrators. Leased by G. S. Peynton, Rackerby, Cal.



Photo No. 70. Mill at the Santa Rosa Mine, near Rackerby, Yuba County, California.

Seaborg and Davis. Brownsville district. Sec. 32, T. 19 N., R. 6 E., M. D. M., $1\frac{1}{2}$ miles north of Rackerby. Elevation 2300 feet. Patented 160 acres. Five quartz veins varying from 2' to 30' wide, along contact of porphyry and diorite. Strike N.-S.; dip 50° W.; 100-foot incline shaft put down by contract for \$12.00 per foot. Lumber costs \$18.00 per M. from the lumber mills near Rackerby. Water available from the Forbestown ditch at \$0.10 per miner's inch. Idle. Owned by J. E. Ebert, of Marysville, and W. J. Mellon, of Challenge.

Slag or Old Flag Mine. Browns Valley district. Sec. 9, T. 16 N., R. 5 E., M. D. M., $\frac{3}{4}$ mile north of Browns Valley. Elevation 280 feet. Patented. Two veins of ribbon quartz, varying from 10' to 4' wide, along contact of serpentine and porphyry. Strike N. 45° W.; dip 35° SW.; 300-foot incline; 800-foot drift. Idle for 25 years. Owned by Mrs. E. Hibbert, of Browns Valley.

Bibl.: Rep. XIII, p. 502, 1895-6.

Smithurst Mine. Browns Valley district. Secs. 8 and 9, T. 16 N., R. 5 E., M. D. M., 2 miles north of Browns Valley. Elevation 300 feet. Patented. Six-inch to 3-foot quartz vein in diorite. Strike N.-S.; dip 45° W.; 70-foot incline shaft, with 100-foot drift north and 100-foot drift south. Workings full of water and said to be caved. Winze sunk at end of south drift. Steam power. Equipment consists of pumps, boilers, blacksmith shop, 1898 model Risdon mill with five 850-lb. stamps, bunkhouse. Ore said to average \$20.00 per ton. Idle since 1911. Owned by George W. Smithurst, of Browns Valley.

Spanish Mine. Brownsville district. Sec. 33, T. 19 N., R. 6 E., M. D. M., $1\frac{1}{2}$ miles northeast of Rackerby near the Golden Key mine. Elevation 2100 feet. Claim on government land. Pine and cedar on property. Water available from Forbestown ditch. A 7-foot quartz ledge along contact of porphyry and diorite. Strike N.-S.; dip 30° W.; 60-foot open cut; 50-foot double compartment shaft open and timbered; 50 tons of the old dump milled \$4.00 per ton. Owned by W. J. Mellon, of Challenge. Option held by G. S. Peyton.

Spotted Cow Prospect. Dobbins district. Sec. 15, T. 18 N., R. 7 E., M. D. M., 4 miles northeast of Dobbins and $1\frac{1}{2}$ miles northwest by trail from Summit House. Contains 20-acre location on railroad land. A 10-foot quartz ledge in granite. Strike E.-W.; dip 45° S.; 30-foot drift. Idle. Owned by F. B. Binniger, of Dobbins.

Summit Hill Mining Co. Dobbins district. In Secs. 22, 23 and 26, of T. 18 N., R. 7 E., M. D. M., 4 miles northeast of Dobbins, on main road to Bullard's Bar. Elevation 2530 feet. Pine, fir, spruce and cedar on property. A 3' to 6' quartz vein along contact between slate and granite. Strike N. 20° E.; dip 47° NW.; 260-ft. incline shaft. On 260-foot level, 100-foot south drift; 100-foot level, 300-foot south drift. Workings flooded with water. Large dump. Idle. Owned by O. H. Greenewald, 310 Sansome Street, San Francisco.

Sweet Vengeance. Browns Valley district. In Secs. 4, 5 and 9, T. 16 N., R. 5 E., M. D. M., $1\frac{1}{2}$ miles north of Browns Valley. Elevation 360 feet. Patented. A 20-foot quartz vein in diorite. Strike N.-S.; dip 60° W.; 350-foot incline, 2-compartment shaft with 100-foot north drift and also a south drift. Shaft flooded. No equipment. Idle. Owned by A. F. Jones, Tonopah, Nevada.

Templar No. 3. Dobbins district. Sec. 29, T. 18 N., R. 7 E., M. D. M., $\frac{1}{2}$ mile east of Indiana Ranch. A 2-foot quartz vein in granite. Strike NE.-SW.; dip 12° E. Worked out to 50 feet in depth. Idle. Owned by J. Merriam, Dobbins.

Too Handy. Browns Valley district. Sec. 22, T. 16 N., R. 5 E., M. D. M., one mile southeast of Browns Valley. Patented. A 12-inch quartz vein; 30-foot shaft. No equipment. Idle. Owned by Mr. Sweezy, of Sacramento, and Mr. McAustin, of Live Oak.

Twentieth Century Wonder Mine. Brownsville district. In Sec. 5, T. 18 N., R. 6 E., M. D. M., $\frac{1}{2}$ mile north of Rackerby. Patented 78 acres. A 6" to 3' quartz vein, carrying free gold, in diorite. Strike E.-W.; 100-foot incline shaft on vein connects with 200-foot tunnel. Equipment consists of a hoist run by a gas engine, 5-stamp mill and Deister concentrator. Idle for one year. Owned by Mrs. Josephine Rose de Marshall, of Rackerby. Option held by a Mr. Peyton.

Whitney. Smartsville district. Sec. 3, T. 14 N., R. 6 E., M. D. M., one mile southeast of Waldo. Elevation 200 feet. Patented. Six-foot quartz vein in diorite. Strike N. 45° W.; dip 60° E.; 50-foot shaft; 14-foot drift. Idle. Owned by J. E. Ebert, of Marysville.

William Arthur Mine. Brownsville district. Sec. 5, T. 18 N., R. 6 E., M. D. M., $\frac{1}{2}$ mile north of Rackerby. Elevation 1750 feet. Patented 120 acres. Water available from Forbestown ditch. An 18" to 2' quartz stringer, carrying free gold, in diorite. Strike N.-S.; dip 35° W.; 30-foot incline shaft. The ore pans. Owned by M. P. Beaver, of Rackerby.

MINERAL PAINT.

On the **Dempsey ranch**, in Sec. 3, T. 15 N., R. 6 E., M. D. M., near Smartsville, is a 12-foot hill capping of light red volcanic tuff which could probably be used for mineral paint. The ore would have to be hauled 14 miles to Wheatland. The property is patented and owned by Mr. John Dempsey, of Smartsville.

PLATINUM.

Considerable platinum is recovered each year by dredgers along the Yuba River. The production by counties has not been segregated until the last few years. Although platinum occurs with the gold in the drift and hydraulic mines, it is not often recognized nor saved.

SAND.

Sand is being shipped quite extensively from the bed of the Yuba River just east of Marysville. A large amount was used by the county in the construction of a new concrete bridge east of Marysville, and

contractors have been shipping large quantities to be used in the state highway.

The **Marysville Sand Company**, J. W. Walker, superintendent, is operating from the levee just east of Marysville in Sec. 24, T. 24 N., R. 3 E., M. D. M. The company has a spur track from the Northern Electric but also ships by way of the Southern Pacific and Western Pacific railroads.

The company has a lease on a portion of the bed of Yuba River 900 feet wide and 2,000 feet long. A $2\frac{1}{2}$ cubic foot drag line bucket is operated by a 4 h. p. donkey engine. A 60-foot derrick carries the $1\frac{1}{4}$ -inch steel carrier cable. The bucket averages a trip every $1\frac{1}{2}$



Photo No. 71. View northward of the drag-line bucket of the Marysville Sand Company, at Marysville, Yuba County, California.

minutes. About 300 cars of 55 tons each are shipped per month. One engineer and three helpers are employed. The sand is taken from the river wet, loaded directly into cars and shipped to points along the Pacific coast. The company has been operating since May 1, 1915.

The **Pratt Building Material Company**, W. A. Smith, 615 C street, Marysville, superintendent, is operating in the bed of the Yuba River in Sec. 24, T. 15 N., R. 3 E., M. D. M., 300 yards below the Yuba River Sand Company. Equipment consists of a one-cubic yard drag-line bucket operated by a donkey engine which loads one bucket in $1\frac{1}{2}$ minutes directly into the cars. An engineer and two helpers are employed.

The wet sand is taken from the river and is sold to the State Highway Commission and to local contractors for \$0.20 per ton. About 150 fifty-ton cars are shipped monthly. The claim has been worked for two years.

The **Yuba River Sand Company**, E. H. Oliver, president, L. L. Green, secretary, Marysville; is operating 100 feet southwest of the Southern Pacific railroad bridge near Marysville. Equipment consists of a $\frac{5}{8}$ cubic yard clamshell bucket, operated by a donkey engine, which makes a trip every $\frac{1}{2}$ minute. Sand is taken out, wet, from a pit in the bed of the Yuba River and loaded directly into the cars on a spur track from the Southern Pacific railroad run out on the river bed. About 12 cars of 40 cubic yards each were being shipped each month for use on the state highways.



Photo No. 72. View northward of the clamshell bucket and hoist of the Yuba River Sand Company, in the bed of the Yuba River, at Marysville, California.

TALC OR SOAPSTONE.

A deposit of soapstone outcrops at Galena Hill, near Camptonville, just below Weeds Point, the hydraulic mine near the mouth of the sluice tunnel. The deposit is about 8 feet thick and parallels a quartz vein, but has never been opened up.

Others deposits of talc have been reported, but they have, as a rule, been found to be small and to lack convenient transportation facilities.

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PART IV

Los Angeles County
Orange County
Riverside County

By FREDERICK J. H. MERRILL, Ph.D., Field Assistant.

PREFACE.

The reports presented herewith on the mines and mineral resources of Los Angeles, Orange and Riverside counties were prepared by Dr. F. J. H. Merrill from field observations during the summers of 1914 and 1915. As noted in the introduction to Riverside County, he was assisted in the latter part of the 1914 season by Mr. Clarence A. Waring of the staff of the Bureau.

We regret to announce that Dr. Merrill died in Los Angeles, November 29, 1916. He was a graduate of Columbia School of Mines, and was State Geologist of New York from 1890 to 1904. He was the author of the report of the California State Mining Bureau, 1914, on the Mines and Mineral Resources of Imperial and San Diego counties.

The counties covered in this present grouping—Los Angeles, Orange and Riverside—though possessing other and quite diverse mineral resources are important producers of two main items, namely: structural materials and petroleum.

Thanks are due to the many companies, owners and operatives in the territory concerned for their cooperation in furnishing data for this report.

FLETCHER HAMILTON.

State Mineralogist.

December, 1916

LOS ANGELES COUNTY.

Field Work in 1915.

INTRODUCTION.

This report on the mineral resources of Los Angeles County is based on work done in past years by the State Mining Bureau and published in its reports Nos. VIII to XIII, as well as in several of its bulletins, and upon the personal work of the writer in visiting, so far as possible, the various mineral deposits and the persons controlling and operating them.

While there is no production of metals here, there is a great wealth of nonmetallic minerals, and their production, in 1914, amounted to \$4,665,504. Further, the rapid growth of the city of Los Angeles, and its great consumption of industrial materials, especially those used in building, has led to the erection, within the city limits, of a number of manufacturing plants of much commercial importance, which convert raw materials into merchantable products. For much valuable information and guidance in the survey of this county, the writer wishes to give due acknowledgment to the Los Angeles Chamber of Mines and Oil and to its able secretary, Mr. G. M. Swindell.

It is peculiarly true of this county that the county seat is the center of accurate information concerning its resources, so that much detail was obtained in Los Angeles as to history and ownership, which could not be secured at the properties.

While diligent effort has been made to cover the field thoroughly, it can scarcely be expected that every deposit of every kind has been observed and noted, but it is hoped that the reader will make due allowance for unavoidable omissions.

ORGANIZATION AND BOUNDARIES.

This county, organized by act of legislature in February, 1850, lies between $33^{\circ} 45'$ and $34^{\circ} 50'$ of north latitude and between $117^{\circ} 36'$ and $118^{\circ} 50'$ of longitude west from Greenwich. Its general form is that of a quadrilateral, measuring about 70 miles from north to south and 65 from east to west.

It is bounded north by Kern County, east by San Bernardino and south by Orange County and the ocean, which, together with Ventura County, forms its west boundary, the ocean shore-line amounting to about ninety miles. It comprises five thousand six hundred square miles, or about three million five hundred and eighty-four thousand acres, a large proportion of which is mountainous, and, in the northeast, is occupied to the extent of about twenty townships, by the Mojave Desert, a flat sandy country with little water, cut up by ranges of low hills of Tertiary rocks.

BIBLIOGRAPHY.

Throughout the following report references are given to the publications of the State Mining Bureau, but, for convenience, in general reading, a list is here given of the publications of that bureau in which the minerals of Los Angeles County are described.

Report	Date	Pages	Authors
VIII	1888	335-342	W. A. Goodyear.
IX	1889	189-210	E. B. Preston.
X	1890	277-283	E. B. Preston.
XI	1892	243-248	W. H. Storms.
XII	1894	25 and 151-153.	W. H. Storms.
XIII	1896	54, 203-205; 504; 614-5; 624; 629; 639; 643.	Various.

Bulletins	Authors	Dates
11. Oil and Gas of Los Angeles, Ventura and Santa Barbara Counties.	W. L. Watts.	1896
19. Oil and Gas of California.	W. L. Watts.	1900
23. Copper Resources of California.	Various	1902
24. Saline Deposits of California.	G. E. Bailey.	1902
33. Structural and Industrial Materials of California.	Various	1906
50. Copper Resources of California.	Various	1908

PHYSIOGRAPHY.

The chief topographic features of this county are the mountain ranges, the valleys and the great Los Angeles plain which stretches from the foothills to the sea. Since the mountains are the most striking to the eye, they may well be first described.

Mountain ranges.

Chief among these is, in the east, the San Gabriel Range, which extends with northwest trend 45 miles from the Cajon Pass to the Soledad Cañon. It forms, on the north, a background to the landscape of Los Angeles and two of its peaks, Mounts Lowe and Wilson, respectively 5650 and 5700 feet in height, are very familiar to tourists, Mount Wilson being also the site of an important astronomical observatory under the supervision of the Carnegie Institution. Six miles southeast of Mount Wilson is Monrovia Hill, 5390 ft. Other prominent peaks near Mount Lowe are Mount Markham, 5760 ft. and Mount San Gabriel, 6152 ft. The foregoing are in the southern division of the San Gabriel Range, or in what may be termed its frontal portion. Immediately north of this, lie the cañons and gorges occupied by the West Fork of the San Gabriel River. Northeast of this deep drainage channel is the main portion of the range, which trends about N. 80° W., and contains all the highest peaks. On the east is Mount San Antonio, familiarly known as "Old Baldy," measuring 10,080 ft. and serving as a corner point in the boundary line between Los Angeles and San Bernardino

counties. Southeast of Mount San Antonio and near it are four other peaks, Telegraph, Sugar Loaf, Ontario and Cucamonga, which are grouped with it as the San Antonio Mountains. Four miles west of Mount San Antonio is Iron Mountain, 7517 ft. high.

About twenty miles northwest is North Baldy, 9389 ft. high, and five miles southwest of North Baldy is Mount Islip measuring 8240 ft. Five miles still farther southwest of Waterman is Pine Mountain, 5903 ft., six miles north of Pine Mountain is Pacifico Mountain, 7078 ft., and about six miles southwest of Pine Mountain is Strawberry Peak, 6150 ft. in altitude. Seven miles northwest of the last, is Mount Gleason, 6503 ft., this having been the center of an old gold mining district. The distribution and conformation of the peaks of the range are well shown on the U. S. Geological Survey topographic sheet known as Southern California No. 1, scale 1/125,000 or about four miles to one inch, and, on six of its component quadrangles on the scale of one inch to one mile, known, in this area, as Tujunga, Rock Creek, San Antonio, Pasadena, Pomona, and Cucamonga.

Loose usage has given to the San Gabriel Range the name of Sierra Madre, but, while this term has thus been freely used by inaccurate persons, it must be said that there is no justification, either geologic or geographic, for so applying the Spanish name of the long, broad and lofty Mexican mountain range, of which the two great branches parallel the coast lines of our sister republic and unite in the south, forming a rude V. The east branch of the Sierra Madre is cut by the Rio Grande near El Paso, Texas. The west branch is traversed by the international boundary near the southeast corner of Arizona and between it and the California ranges is the great depression of the Colorado Desert. Therefore, strictly speaking, the Sierra Madre Range does not occur at all in California and the name should not be used here.

Other ranges in Los Angeles County are the Sierra Santa Susana and the Sierra Santa Monica. The former, which is structurally the continuation of the San Gabriel Range, lies north of San Fernando Valley, its west extension in Santa Barbara and Ventura counties being called Sierra Santa Ynez, and the Santa Monica Range flanks the coast, extending from the ocean in Ventura County eastward to the Los Angeles River. The Santa Susana and Santa Ynez ranges are chiefly formed of tertiary sedimentary rocks but the San Gabriel Range is mainly crystalline, its central axis consisting of granite with gneisses and schists on its flanks.

Parallel with the San Gabriel Range, from which it is separated by the valleys called La Cañada and Tujunga and bordering, on the north, the east end of the San Fernando Valley, is the Verdugo Range, formed mainly of tertiary sedimentary rocks with some granite intrusions.

The sedimentary rocks are of relatively low altitude, the highest point in the Santa Susana Range being only 3756 ft., while the highest of the Santa Monica Mountains, Saddle Peak, measures but 2836 ft. and the highest point in the Verdugo Mountains measures but 3134 ft.

Rivers.

Los Angeles County has two principal rivers, San Gabriel and Los Angeles. The San Gabriel takes its source in San Gabriel Range, having two principal branches, of which the West Fork rises on the north slope of Mount San Gabriel in T. 2 N. R. 12 W., S. B. M., and the various creeks that form the east branch rise in T. 3 N. R. 8 W., S. B. M. The two branches unite in Sec. 29, T. 2 N. R. 9 W., S. B. M., and the stream, thus formed, flows thence southwest, reaching the ocean through Alamitos Bay. The river emerges from its cañon about one mile northwest of Azusa and its broad dry wash extends 8 or 9 miles southwest to El Monte, where, at its western margin, rises the Rio Hondo. This stream, paralleling the San Gabriel, flows seaward to a point three miles southwest of Downey and there unites with the Los Angeles River, receiving the flow of the latter and bearing its name in its course south to Long Beach Harbor.

The Los Angeles River rises in the Santa Monica Mountains, near Ventura County, and flowing thence through San Fernando Valley east and south, unites near Compton with the Rio Hondo, its waters emptying into Long Beach Harbor. Its principal tributary is the Arroyo Seco, which rises north of Pasadena, in the mountains west of Mount Lowe, and, as its name indicates, shows running water only after heavy rains.

The San Gabriel, in the upper part of its course, is torrential, contributing thereby largely to the topographic changes that take place on the mountain flanks and in the cañons, denuding large areas in one place and throwing up accumulations of wash and debris in others. During heavy rains in the cañons changes of water level of ten and twelve feet in less than half an hour are frequently recorded. Yet, notwithstanding the large amount of water that passes over this river bed for the greater part of the year, the water sinks beneath the surface before reaching the ocean.

GEOLOGY.

The first professional study of Los Angeles County in this branch of science was made in 1853-4 by Dr. Thomas Antisell, who accompanied the expedition sent by the U. S. Government, under Lieut. R. S. Williamson, to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean. The reports of this expedition were published at Washington as U. S. Senate Documents, in 1857. Doctor Antisell's Report is in Vol. VII.

In 1855 Dr. J. B. Trask, first State Geologist of California, spent some months in field work covering Los Angeles County and vicinity, his results being published in Vol. VII, No. 14, Sacramento, 1855, under the title of "Report on the Geology of the Coast Mountains, etc." In this report Dr. Trask discusses the structure of the San Gabriel and San Bernardino ranges and of the plain of Los Angeles, giving some attention to artesian waters.

In 1889, under the California State Mining Bureau, a study of the mineral resources of this county was made by Mr. E. B. Preston, his report being printed in the IXth Report of the State Mineralogist, pages 189-210. This supplemented the observations of W. A. Goodyear, made in 1872 and published in 1888, in the VIIth Report of the State Mineralogist.

In 1897 Mr. W. L. Watts made a study of the Los Angeles oil field and others adjacent, which was published in C. S. M. B. Bulletin No. 11, "Oil and Gas Yielding Formations of California."

A later study of this region, with special reference to petroleum, was made from 1901 to 1906 under the auspices of the U. S. Geological Survey, by Messrs. George H. Eldridge and Ralph Arnold. Their results are published in U. S. Geological Survey Bulletin No. 309.

A detailed discussion of the Geology of Los Angeles and vicinity, by Mr. Arnold, is given in Bulletin 309, on pages 143-157, and is illustrated by a geologic map, Plate XVIII.

A publication of the U. S. Geological Survey issued in 1915, Bulletin No. 613, Guide Book of the Western U. S., Part C., contains a very complete résumé of the local geology, along the line of the Santa Fe Railway, by Mr. N. H. Darton and others, and is made specially readable and instructive by a series of local maps.

To these volumes the reader is referred for details which are there more clearly presented than they could be in any abstract prepared by the present writer.

TOPOGRAPHIC MAPS.

The engraved topographic quadrangles of the U. S. Geological Survey, cover nearly all of Los Angeles County. Consequently, most of it is included in the sheets known as Southern California Nos. 1 and 3, on the scale of 1/250,000, or about four miles to one inch. Part of the county, at the west, falls within the Camulos and Tejon quadrangles, on the scale of 1/125,000 or two miles to one inch. The central, eastern and southern portions of Los Angeles County, are covered by the following fifteen quadrangles, on the scale of 1/62,500 or one mile to one inch; Santa Susana, Fernando, Tujunga, Rock Creek, San Antonio, Calabasas, Santa Monica, Pasadena, Pomona, Cucamonga, Redondo, Downey, Anaheim, San Pedro, and Las Bolsas. The extreme southeast

corner of the county falls within the Corona quadrangle, scale 1/125,000 or two miles to one inch. Several general maps of the county have been compiled but none of them deserves special mention.

MINERAL RESOURCES.

The mineral products of this county, aggregated, in 1914, nearly \$5,000,000. The materials contributing to this aggregate, are wholly nonmetallic. In the following pages, are given, with all possible accuracy, the details of distribution and ownership concerning the various minerals which are discussed in the order given in the Table of Contents.

METALS.

The following metals occur in Los Angeles County: antimony, chromium, copper, gold, iron, lead, manganese, silver, and zinc.

Only one metal, gold, has been produced in Los Angeles County, in appreciable quantity. The traditions and records of placer mining show a substantial production early in the 19th Century but no other metal out of several which have been found here has ever attained any commercial importance. In the following pages the record has been made as complete as possible.

ANTIMONY.

This metal is extensively consumed in the alloy with lead known as type metal. It has never been mined commercially in Los Angeles County and but one occurrence has been recorded. This was at Lancaster¹ but no details are available and the locality has been forgotten. At the present time the high market price of this metal makes it a matter of much interest and its ores will, doubtless, be eagerly sought for by prospectors.

In the reference given below,¹ antimony is also noted as occurring seven miles from Los Angeles but no one now living recalls this discovery.

The **Western Metals Company**, M. Elsasser, manager, H. N. Simpson, secretary; with offices in the Security Bldg., Los Angeles, has an antimony smelter in operation at Harbor City in this county. The ores treated are derived from various sources along the Pacific Coast, including points in Alaska and South America. A small tonnage is being obtained at the present time from Californian mines, principally in Inyo and Kern counties. A high grade "star metal" is produced.

¹C. S. M. B. Bulletin 38, p. 359.

LOS ANGELES COUNTY—Table of Mineral Production.

Year	Gold value	Silver value	Petroleum		Asphalt—Natural Gas (Tons)		Opium		Salt		Crude value	Mineral water		Brick		Clay		Sandstone and serpentine		Stone industry value	Miscellaneous and unapportioned	
			Barrels	Value	Amount	Value	Tons	Value	Tons	Value		Gallons	Value	M	Value	Tons	Value	Cubic feet	Value		Quantity and kind	Value
1880	\$7,700	\$60,300																				
1881	13,000	39,000																				
1882	17,000	21,000																				
1883	20,000	25,000																				
1884	40,000	11,000																				
1885	22,500	1,945																				
1886	21,500	6,750																				
1887	25,000	25,000																				
1888	20,000	10,000																				
1889	38,200	97																				
1890	74,320	7,200																				
1891	46,750																					
1892	219,204																					
1893	14,200																					
1894	31,500		475,050	\$617,005			1,134	\$11,340						7,500	\$27,500						2,500 barrels lime	\$15,500
1895	23,320		970,095	732,817			3,790	37,900						45,800	235,000							
1896	35,468		953,724	\$12,900			909	9,090						27,478	176,250							
1897	46,698		1,327,011	1,327,011			1,900	17,550						30,568	228,200						5 tons asphalt paving	50
1898	21,300		1,462,871	1,462,871			2,500	18,500						25,900	188,280	50	\$500	10,500	3,200		2 tons asphalt	
1899	13,132		1,469,356	1,469,356	1,151	\$23,020	3,563	14,250				109,500	\$5,800	23,385	147,400						1,600 cubic feet marble	2,000
1900	5,548		1,722,887	1,722,887	15,000	100,000	2,500	10,000						56,725	275,925	4,500	10,770					
1901	10,312		2,304,432	1,662,068			3,500	33,500	6,650	\$19,950				14,415	264,825	130	500	480			10 tons soapstone	19
1902	7,200		2,108,406	1,075,868	14,767	171,704			00	180				53,776	335,670	800	800				100 tons mineral paint	300
1903	8,674	22	1,960,604	1,294,866	128,308	\$10,000	5,914	28,441	8,000	20,000		95,000	\$500	70,195	706,334	115	115	52,103	9,734		100 pounds lead	20
1904	12,402	73	2,190,900	1,380,910	150,425	767,408			7,500	24,480		125,750	7,064	128,719	767,887	5,000	3,000	32,211	1,145		60 tons infusorial earth	350
1905	15,035	100	2,854,564	1,656,188	123,718	110,430	11,500	43,500	12,000	20,000		175,000	1,250	109,503	\$53,510	20,533	10,960	18,784	9,950		100 tons infusorial earth	300
1906			2,814,000	906,800	125,920	250,200	21,000	69,000	12,000	20,000		85,465	5,128	127,305	826,831	41,350	34,250	170,700	9,540		50 tons infusorial earth	300
1907			4,318,739	2,633,541	126,610	350,923	7,500	50,900	12,000	30,000		585,700	3,100	101,070	898,772	17,500	20,500	121,106	12,050		50 tons infusorial earth	300
1908			6,214,347	4,082,092	125,000	350,000	12,000	75,000	12,000	48,000	\$8,500	572,000	10,800	108,414	800,000	25,904	53,274	56,000	10,000		50 tons infusorial earth	300
1909	864	2	5,409,392	3,513,192	140,710	310,000	10,000	60,000	10,000	30,000	9,500	266,215	9,988	136,202	1,105,892	11,027	26,688				Unapportioned, 1900-1909	\$47,550
1910			5,127,300	3,185,433	500,920	35,208			6,000	12,000	4,900	\$19,491	3,000	148,723	1,361,403	450	800				50 tons feldspar	4,200
1911			4,021,288	3,313,972		715,208			7,500	10,113	5,000	225,010	17,200	160,259	1,442,913	15,650	41,025					
1912			4,481,500	2,798,384		718,012			10,000	60,370	3,000	70,495	6,333	171,802	1,092,538	11,029	15,000					
1913	2,322	27	4,143,000	2,672,680	11,287,704	77,018			10,000	60,000	2,500	255,005	15,100	204,912	1,732,106	7,425	20,135					
1914			3,568,000	1,957,279	11,250,000	75,000			20,000	60,000	2,100	331,101	8,025	135,587	1,244,971	8,263	16,666				10 tons potash	\$12,000
1915			2,931,065	1,843,661	11,759,005	120,700					700	330,171	24,091	88,669	829,913	6,500	1,511				Other minerals	\$30,000
Totals	\$804,140	\$216,592	63,705,400	\$10,772,671		\$8,561,153	87,701	\$470,751	134,252	\$160,000	\$30,300	\$3,401,427	\$12,950	2,061,594	\$16,252,028	190,829	\$280,514	\$90,039	\$15,471			\$1,294,072

*Included in Riverside County production.

†Included in Monterey County production.

‡Asphalt, tons.

§Natural gas, thousand cubic feet.

¶Sandstone.

‡Serpentine.

§Includes granite, crushed rock, rubble, paving blocks, sand and gravel.

¶Includes barite, borax, potash, salt.

CHROMIUM.

Chromite, the common ore of this metal is but little known in Los Angeles County. Only two occurrences have been reported. One is one mile west of Harold Station on the S. P. R. R. in T. 5 N., R. 11 W., S. B. M. The owner of one claim located on the deposit is **Nick Evert**, 1027 W. 16th St., Los Angeles. Another is said to be quite close to the railroad station at Acton, T. 5 N., R. 13 W. The ownership of this is unknown.

Chromium compounds are largely used in pigments and dyes, the so-called chrome yellows and greens being familiar to all. Chromium salts are also used as mordants in dyeing. The metal is largely used in alloys with iron and steel on which it has a marked hardening effect, chrome steel being used for armor and projectiles. Another extensive use is in making refractory brick and furnace linings. The chief output of chromite for the United States is from California, in the counties of Siskiyou, Glenn, Shasta, Calaveras, and Fresno.

COPPER.

On page 346 of Bulletin No. 50 mention is made of some copper claims which were under development in 1908, when that Bulletin was issued.

None of them became a producer and they have been nearly forgotten. The descriptions given are copied here as a matter of history.

Palm Development Company. This company superficially developed some claims twenty-three miles northeast of Acton or 12 miles southeast of Palmdale and three miles southeast of Little Rock Creek, in Sec. 30, T. 5 N., R. 10 W., San Bernardino meridian. (See Rock Creek Quadrangle, U. S. G. S.). The ore occurred in a porphyritic dike, which averaged 180 feet in width. The mineralized zone may be traced for one and a half miles. Three shafts had been sunk. While some ore was encountered in these shafts, they failed to show any defined ledge or continuous deposit. The ore was chiefly malachite and carried gold and silver. The claims were leased to Messrs. Elliott and Leavitt, who erected a leaching plant. E. M. Ross and Joseph H. Call, of Los Angeles, owners.

An extension of the claims of the Palm Development Company was owned by William M. Van Dyke of Los Angeles.

Free Cuba. Half a mile south of the railroad station at Acton. This property was first worked about 1860, and abandoned. The old shaft was later cleaned out, and at the bottom, 200 feet from the surface, samples of native copper were found. The deposit is in a quartz vein, 23 feet wide in granite. Ira L. Houser of Acton, owner.

Mooney and Williams Claim. Two miles south of Acton. Men were at work developing the property, and, in the tunnel, some fair copper ore had been encountered. The character of the ledge was similar to that of the Free Cuba. Mooney and Williams of Acton, owners.

Between Acton and Ravenna, in 1889, were a group of copper claims worked by the **Emma Consolidated Mining Company**, concerning which Mr. E. B. Preston writes as follows:²

"This property consists of the following ledges: The Emma Ledge, four feet wide, ranging to the northeast and southwest, and dipping to the east very slightly, containing silver and copper in quartz. A shaft has been sunk to a depth of seventy-five feet, and a tunnel run in five hundred feet, but will have to be continued another one hundred feet to strike the vein, which it should do at a vertical depth of four hundred feet. The tunnel is six by eight feet with an air shaft. Wood and water are plentiful in the vicinity of the mine. The Bullion vein is situated on the same hill, and in close proximity to the Emma. It runs parallel with the Emma, and dips towards it. The ledges can be seen in a deep cutting with a width of eight feet. The ore carries gold, silver and copper.

"The Pacific is the extension of the Bullion on the same vein. The London crosses the other two veins, running almost east and west. They are four full claims and were located in 1888, but had been worked years before for a French syndicate. The Pacific has a shaft forty feet deep, showing a well defined, six-foot ledge containing gold, silver and copper ores. The London ledge is about three feet wide, containing copper and silver. It has an incline shaft forty feet deep, showing a well defined, six-foot ledge, containing gold, silver and copper ores. The London ledge is about three feet wide, containing copper and silver. It has an incline shaft seventy-five feet deep and a tunnel one hundred feet long, which will ultimately tap the ledge at a depth of about three hundred feet. The ores are carbonates and sulphides in quartz; the country rock is granite. The value of the Bullion and Pacific ores, from tests made, is \$4.00 in gold and \$15.00 in silver.

"The Emma vein contains 15 % copper and 15 ounces of silver. The Bullion and Pacific dip to the west, the Emma to the east and the London to the south. About two and one-half miles south of Acton, close to the railroad and at an altitude of two thousand two hundred feet, a shaft was sunk to a depth of thirty-five or forty feet on a strong vein of copper and silver ore; but, at that depth, the parties sinking, encountered so much water that they abandoned the property."

²C. S. M. B., R. IX, p. 194.

GOLD.

While Los Angeles County, at this time, has no producing gold mine, this precious metal is rather widely distributed over its area and, at times in the past, has been recovered in substantial amounts, from some districts. Here, as elsewhere in the world, gold was first found in placer deposits and, in this class, there have been two principal areas of production.

The placers, which were early worked by priests of the Spanish Missions at San Fernando and San Gabriel, were in the Casteca³ Cañon District northwest of Newhall, in Soledad Cañon northeast of Newhall, and farther eastward in the cañons of the San Gabriel River in the mountain range of the same name.

While these placer fields were once very productive, mining operations in them have been so long suspended that little information is to be had on the ground.

It seems best, therefore, to quote reliable data already published and the following descriptions are, in part, from the report of E. B. Preston,⁴ in part from that of W. H. Storms⁵ and in part, from a paper read in 1858 before the Pioneer Association of Los Angeles County, by W. W. Jenkins.

AURIFEROUS GRAVELS OF CASTECA, PALOMAS, AND SANTA FELICIA CAÑONS.⁶

(See Camulos and Tejon Quadrangles—U. S. G. S.)

Going northwesterly from Newhall about six miles to the crossing of the Santa Clara River at Casteca we enter the mouth of Casteca Cañon in which is a creek of the same name. Following up this creek about six miles, we find extensive deposits of auriferous gravel, northwest. Going northwest over the divide from Palomas Cañon we enter Santa Feliciana Cañon, where placer deposits were long ago worked.

In this region, about forty miles northwest from Los Angeles, were discovered, in 1834, the placers of San Francisquito, Placerita, Casteca, and Santa Feliciana, which were worked between the years of 1834 and 1838, by priests of the San Fernando and San Buena Ventura Missions, under the supervision of Francisco Lopez, for the San Fernando Mission, and Jose Bermudez for the San Buena Ventura Mission.

In the latter part of 1838, one Francisco Garcia was piloted to and shown by Francisco Lopez, the placer at Santa Feliciana.

Garcia went to Sonora, Mexico, in 1839 and in 1840 returned with 30 Mexican placer miners, and, during the latter part of 1840 and the first part of 1841, took from the Santa Feliciana Gulch, two hundred

³Sometimes spelled Castaic and Castac, but the form used above has the weight of priority.

⁴C. S. M. B., R. IX, p. 201.

⁵C. S. M. B., R. XI, p. 248.

⁶C. S. M. B., R. IX, p. 201.

and twelve lbs. of gold, avoirdupois weight, as weighed by D. W. Alexander, who, in 1855, made affidavit to this effect. At the time the above gold was taken from this gulch, it was named, by Garcia, Santa Feliciana,⁷ and has retained this name to the present day.

After the rush during 1855 and 1856 to Kern River, Slate Range and Cerro Gordo, and what is now known as Randsburg, many of the people thence drifted into Santa Feliciana, Casteca and San Francisquito.

During the years 1857 and 1858 there were not less than six thousand people mining for gold in the last named places.

This territory was visited in 1872, by W. A. Goodyear and in 1889 by E. B. Preston, of the State Mining Bureau. Mr. Goodyear's description appears in Report VIII, p. 332, and that of Mr. Preston is printed on pages 201-203 of the IXth Report of the State Mineralogist. His statement is, in part, as follows:

"The richest part of the gravel is not exclusively on the bedrock, but in streaks in the gravel, that can be plainly distinguished by a heavy deposit of Iron Oxide. These lie, in places, considerably above the bedrock and sometimes above one another. The accounts of the yield from this gravel, which was worked years ago, are very conflicting. The Mexicans are said to have formerly taken out large sums, a statement which the extent of their workings, in some places, would seem to corroborate. Later workers on the ground put the yield, per cubic yard, rather low, but, even at their figures, if, as was thought possible, water could be brought from Piru Creek, all this immense tonnage of gravel could be made to pay something handsome above expenses. The height of the gravel is hard to estimate, it having been cut out so much. It has been given as averaging ninety feet, but that is probably rather high. Between these gravel hills and Casteca Cañon is a range of hills composed mostly of sandstones and cemented conglomerates, crowned beyond by a range of metamorphic rocks, which show some quartz veins that have been prospected by tunnel, but are now entirely abandoned.

"Crossing Casteca Cañon, opposite the mouth of Palomas, and going northeasterly up over the hills, we again find a large area of auriferous gravel on the other side of Charlie Cañon, that was once taken up by a New York company. Their ground comprised an area of nine thousand acres, extending up both sides of the Cañon La Dura. To work this ground by hydraulic method, the only way in which it could be advantageously disposed of, required the bringing in of a ditch from Elizabeth Lakes, a distance of four miles, in which a large fall would be obtained. The gravel here differs from that of Santa Feliciana, in that it is harder, more cemented with iron. The bedrock, where seen, is sandstone; the gravel is not as smoothly washed as in the other. A good deal of work has been done in these cañons by Mexicans and

⁷A Spanish name expressive of rejoicing.

Americans with pan and rocker. The gravel is about six feet thick in the cañons. The gold is not coarse as in Santa Feliciana Cañon.

A third company was organized, under the name of the Nevada Gold Mining Company, which claimed three thousand five hundred acres between Elizabeth Lakes and Casteca Junction. It held a water right of one thousand miner's inches out of the Casteca Cañon."

Mr. Goodyear writes of these placers as follows:

"The average elevation of this placer area is one thousand four hundred feet. This gold belt, which is about ten miles long from south-east to northwest and about eight miles in width, though chiefly sedimentary, is the northwest extension of the San Gabriel Range. The auriferous tracts are situated mainly in T. 5 N., R. 16 W., S. B. M., and the gravel averages ninety feet in depth. The surface slope from the highest to the lowest point of gravel averages one hundred and fifty feet to the mile. The gravel dips south with the bedrock. This deposit is cut through by numerous small gulches running in various directions, each gulch having been worked, off and on, in a small way, for some thirty years. A portion of this ground was purchased, about 1888, by an English syndicate."

As described by Mr. W. H. Storms, R. XI, p. 248, there were placers north of Newhall and northeast of Casteca in the gulches known as Dry Cañon, El Cañon de Los Muertes or Dead Men's Cañon, and, in the San Francisquito, all of which produced a large amount of gold. These Newhall placers were formerly worked systematically and cheaply, and, it is said, with good results.

The San Gabriel Mountain Placers.*

The southerly slope of this range was the site of a placer field worked by the priests of the San Gabriel Mission and also, by the native Californians prior to the discovery of gold at Sutter's Mill, and abandoned in 1848, in consequence of that event.

Later, placer mining was carried on along several gulches in that region, and generally with satisfactory results.

In 1889, a company, made up of residents of Redlands, expended quite a sum of money in the construction of a dam and a rim-rock tunnel, and in laying down eight hundred feet of sluice boxes for working a gravel claim located and owned by them in San Antonio Cañon. This tunnel cut what was evidently an ancient river channel, the contents of which paid beyond the company's expectations. Some drift operations have also been carried on at considerable elevations in these mountains, and along Lytle Creek, farther east, where placers have been worked ever since 1860.

*Xth Rep., p. 519.

Concerning the San Gabriel Cañon placers, Mr. W. A. Goodyear wrote as follows:⁹

"In September, 1874, the writer made a trip up the San Gabriel Cañon, some three or four miles above its mouth, and twenty-four or twenty-five miles from Los Angeles. The rocks here are all granitic. There is some auriferous gravel scattered about, high up on the spurs of this range, similar in its general character to that which forms the great hydraulic mines (now for some years utterly stopped by injunctions of the United States Courts) on the western flank of the Sierra Nevada, in the more central counties of the state.

"There is every reason to believe that these high and ancient auriferous gravels of the San Gabriel Range and also the great mass of the whole range itself, from the Cajon Pass west, nearly or quite to the Los Angeles River, belong to the same geological ages, and derived their origin from the same causes as those of the western slope of the Sierra Nevada. The amount of denudation which has taken place since these ancient gravels were deposited has, of course, been something enormous, and no man can measure it."

In the western part of this range, along the Soledad Cañon and northeast of Newhall, as well as between Lang and Ravenna, placers were reported in 1894.¹⁰ At present, however, there is no production from these fields.

Besides these inland placers above described, deposits of auriferous sand have been found sparingly on the sea coast, and some years ago¹¹ a company was formed to recover gold from beach sands at Ballona, now known as Playa del Rey.

QUARTZ VEINS.

Vein mining for gold in this county has been practiced in several areas. They are all described in the early reports but all have been unproductive for some years.

In the northwestern part of the county were several gold districts which were reached from Acton Station on the S. P. R. R. One of them was Cedar Mountain District,¹² comprising parts of Townships 4, 5, and 6 North in Ranges 12 and 14 West. Much of this district lay north and west from Acton. The chief properties here were the Red Rover and New York mines. Now idle.

Southeast of Acton about seven miles, was the Mount Gleason District,¹³ centering around the peak of that name in Secs. 25, 26, 35, 36, T. 4 N., R. 13 W., S. B. M. The chief mines here, in 1896, were the

⁹VIIIth Report, State Mineralogist, p. 340.

¹⁰R. XII, p. 152.

¹¹R. XIII, p. 203.

¹²C. S. M. B., R. IX, p. 191.

¹³R. IX, p. 195; R. XIII, p. 204.

Padre, Mount Gleason, Kelly, Peerless, and the Casa Grande mines, named Gold Bullion, Log Cabin, Veteran, Golden Rule, and Old Town.

Sixteen miles southeast of Acton was the Monte Christo group of mines, comprising Dos Robles, Mikado, Monte Carlo, and Monte Christo and, near by, the Tujunga Group,¹⁴ including the Baltic, Boston, California, Los Angeles, Nevada, and Pacific.

The mines of these groups have been idle for many years and little is remembered concerning them.¹⁵

Another region of gold-bearing quartz veins was in the San Gabriel Range, adjacent to the cañons of the San Gabriel River.

Here, on North Baldy Mountain, in Secs. 7 and 8, T. 3 N., R. 8 W., S. B. M., are the claims of the **Big Horn** and **Called Back Mines**.

These are now owned by the **Lowell and California Development Company**, 712 Story Bldg., Los Angeles, and are being developed under lease by Mr. Seeley W. Mudd, of Los Angeles.

The corporation holds fifteen claims and two mill sites, all of which are patented. The vein is described as twenty-five feet wide on a contact between gneiss and schist. The strike is N. 40° to 60° E. and the dip 20° NW. By isolated outcrops it has been proved for 2500 to 3000 ft. A 600-ft. tunnel cuts the vein 400 ft. below the outcrop. There is a ten stamp mill on the ground but no production has been achieved.

Other gold quartz veins, which have not lately been materially productive, are in the San Gabriel Cañons. One of these was the Kelsey Mine¹⁶ near Fellows Camp, which is reached from Azusa. Nearby was the Allison Mine and the Victoria.¹⁷ Still other veins in the San Gabriel Range, are noted in Report XI, p. 247.

Near Los Angeles two prospects have been opened but have never been producers. These were: **The Cahuenga Mine**,¹⁸ described in 1896 as seven miles north of Los Angeles. This may have been in the hills of Griffith Park and near the Cahuenga Pass, but it has long been forgotten. There is, however, a tradition of an old prospect in Laurel Cañon near Hollywood.

The Dawn Mine. This is near the bottom of Millard Cañon on the southwest slope of Mount Lowe. The vein, which occurs in granitic rocks, strikes nearly east and west and its dip is nearly vertical. The mineralization is with iron sulphides, rich in gold. Considerable development work has been done by adits but no large body of ore has been opened. The foregoing data are from a report by Mr. J. Nelson Nevius of Pasadena. The owner of the property is Mr. M. T. Ryan, 4083 Moneta Ave., Los Angeles.

¹⁴R. XIII, p. 204.

¹⁵R. VIII, p. 332; R. IX, p. 191; R. XI, p. 246; R. XII, p. 153; R. XIII, p. 204.

¹⁶C. S. M. B., R. XIII, p. 203; R. XI, p. 243; R. XIII, p. 204.

¹⁷R. XIII, p. 205.

¹⁸R. XIII, p. 203.

IRON.

Iron ores are rare in this county, but a few occurrences are noted in Bulletin No. 38, page 297. As a matter of history the record is copied here.

A deposit of magnetite lay within 200 yards of the Southern Pacific Railroad, at Russ Station (Soledad Cañon). Only a little development work had been done. Some years ago a small furnace, using oil as fuel, was erected at the deposit, but proved a failure.

The owners of this deposit in 1906 were John Carroll, Fourth and Junipero streets, Long Beach, and J. D. Rivard, 2915 Downey Avenue, Los Angeles.

Another deposit was called the Iron Mack; H. Reblick, Acton, and E. L. Baker, 713 West First Street, Los Angeles, owners. This was in Sec. 36, T. 6 N., R. 14 W., S. B. M. at the head of Mint Cañon, about ten miles northwest of Acton, and was described as a deposit of low-grade material, containing some small pockets of magnetite, accompanied by some manganese ore. From a pit less than 10 feet deep, some ore was shipped a few years prior to 1906.

The writer is informed, on reliable authority, that these ores proved to contain titanium and consequently were not of commercial importance.

LEAD.

This metal is not abundant in this county and its ores have not been mined commercially. Associated with silver it occurs sparingly at a few localities and as noted under Silver has been reported from the old Silver Mountain Mines¹⁹ east of Casteca Cañon. This lies in T. 6 N., R. 16 W. A small production of lead from the Kelsey mine in San Gabriel Cañon, five miles from Azusa, was reported in 1892.²⁰ In association with silver and zinc sulphides lead in small quantities was reported from Santa Catalina Island in 1890.²¹ It does not appear that any of these deposits have been developed or worked to any extent since they were originally reported to the State Mining Bureau.

MANGANESE.

But little of the ore of this metal is known in this county. The only reported deposit is one belonging to **A. Mayet**, 328 Higgins Bldg., Los Angeles. It lies four miles west of Palmdale, T. 6 N., R. 12 W., S. B. M. The holdings amount to nine claims. There is said to be seven feet of ore averaging 45 to 48% of MnO_2 with 8 to 10% of silica. No production is reported thus far.

¹⁹R. IX, p. 203.

²⁰R. XI, p. 247.

²¹R. X, p. 279.

SILVER.

This precious metal has been found at but few points in this county, only four localities having been recorded. These were (I) The Silver Mountain Mining District, east of Casteca Cañon, see Report IX, p. 203-4; (II) the San Gabriel Cañon, north of Azusa, see R. XI, pp. 243-6 and R. XIII, p. 204; (III) on Santa Catalina Island, see R. X, pp. 279-80, also R. XII, p. 25; (IV) in R. IX, p. 194, is mentioned the Emma vein, between Acton and Ravenna which, in addition to copper, was said to carry 15 oz. of silver. This ground is not now worked.

There is no record of productive operations in the Silver Mountain District, since 1889. The Kelsey Mine, five miles north of Azusa, in San Gabriel Cañon, has been idle since 1892; likewise the Sierra Madre Silver Mining Company's mine, since 1895; and the small veins once prospected on Santa Catalina Island have lain untouched so long that the most diligent search by the writer fails to find any man who worked on them when they were prospected in 1890. According to the statement in R. X, p. 279, on this island, the silver was contained in galena associated with zincblende.

It is rumored that a primitive form of smelting was formerly practiced here in small rude furnaces.

ZINC.

This important metal is in great demand to alloy with copper in making brass and is also much used in protecting iron from rust in the process known as galvanizing.

But little has been reported in Los Angeles County and at only two localities. One of these was the Kelsey Mine in San Gabriel Cañon five miles north of Azusa,²² the other was on Santa Catalina Island,²³ on Black Jack Mountain and at the junction of Silver and Grand Cañons. At the time of Mr. Preston's visit to the second locality in 1890 but little development had been done and no production achieved, and since that time the deposits have been abandoned and forgotten, the Banning company, which owns the island, having devoted its energies to seeking income from other sources.

NONMETALLIC MINERALS.

The nonmetals are commercially the most important among the mineral products of this county. In 1914 their aggregate value was upwards of \$4,000,000.

The presence here, of the metropolis of southern California, has developed a great demand for materials employed in the building trades

²²R. XI, p. 243.

²³R. X, p. 279.

and all important deposits of minerals used in the manufacture of structural materials have been energetically developed and worked. Los Angeles County, therefore, produces a large part of the nonmetallic minerals locally consumed and their record consequently occupies many pages and the larger portion of this county report.

The following nonmetals are found or produced in Los Angeles County: Abrasives—corundum;* barite; borax; building materials—building stone, granite, marble, sandstone, serpentine and steatite, trachyte, crushed stone and sand, lime, Portland cement, artificial stone; crays—brick and pottery; coal;* feldspar;* fuller's earth; gems; graphite; gypsum;* infusorial earth;* mineral paint; mineral water; petroleum and natural gas; potash; salt.

ABRASIVES.

Corundum. In San Antonio Cañon, about five miles above Uplands, is a large body of syenite containing ruby corundum. The rubies occur in small prismatic crystals, and might be utilized as an abrasive, if they can be concentrated economically out of the mass of the syenite.

BARYTES.

(Heavy spar.)

This mineral, in composition, barium sulphate, is comparatively rare in Los Angeles County. It has been reported from Azusa²⁴ but the locality is not well known. It is also found in the west fork of San Dimas Cañon, T. 1 N., R. 9 W., whence a small tonnage is reported to have been shipped recently. The owners of this latter deposit are C. V. Foresman, John Bradley, and Geo. Rogers of San Dimas.

Barytes or barite is chiefly used as a pigment and to a small extent in the manufacture of glass.

BORAX.

The production of this mineral in Los Angeles County amounted in 1914 to nearly \$500,000. This was chiefly the output of the **Sterling Borax Company** of 320 Trust and Savings Bldg., Los Angeles, Thos. Thorkildsen, president, of which the mine is five miles north of Lang in Tick Cañon. This corporation controls some 1,200 acres and mines a large deposit of colemanite. In a mill on the property, the crude material is separated from such impurities as clay and shale, and calcium borate is shipped to Pittsburgh and Chicago to be refined into commercial borax.

The deposit is probably a tilted lake bed and is of great interest but the management request that no details be published.

*Not produced.

²⁴Bull. 38, p. 360.

At San Fernando is the manufacturing plant of the **Paradise Borax Mining Company**, which controls no borax deposit, and of which the product is chiefly mineral paint, sold under the trade name of Silumnia Kalsomine. Among the officers of this corporation are O. C. Gray, president, and W. S. Booher, secretary, both of San Fernando. This deposit will be further mentioned under "Mineral Paint."

BUILDING MATERIALS.

BUILDING STONE.

Not many years ago building stone or rock of attractive appearance and durable qualities which could be cut or dressed to a convenient form and size for building operations was a matter of much importance and a substantial asset to any state or county, but with the lapse of time and the development of new methods of construction, brick, terra cotta, and concrete have been so extensively substituted for cut stone, that the latter has become of minor importance and many deposits of material formerly available and in demand now lie unnoticed. In this report, space will be given only to building stones formerly worked or now in use for special purposes.

Among the building stones occurring in this county are the following, although they are not all produced commercially: granite, marble, serpentine, sandstone, volcanic tuff and trachyte.

Granite.

No stone of this class has been worked in this county except by crushing plants for concrete.

In Bulletin No. 38, p. 28, is the following description:

E. M. Ross, Glendale. On the Glendale ranch, Verdugo Cañon, 8 miles from Los Angeles, and three-fourths of a mile from the railroad is a body of very dark hornblende biotite granite, somewhat banded (gneissic), taking a very high polish, and very well adapted for monument work and for trimming the light-colored granites and marbles. No development work.

Much granite is exposed in the San Gabriel Range but the outcrops are high and inaccessible.

Marble.

No stone of this class has lately been worked in Los Angeles County, though there is a record of a Southern California Marble Company with a quarry operated near Neenach by John Rebman of Los Angeles. This record can not now be verified as Mr. Rebman has moved to Arizona.

Crystalline limestone, which, in some localities makes a high class marble, is described by W. A. Goodyear²⁵ as occurring in Pacoima Cañon near San Fernando. It does not appear, however, that this material has been used for other purposes than making lime.

²⁵Bull. 38, p. 100; also, R. XIII, p. 629.

Prof. R. T. Hill of the U. S. Geological Survey, states that on the southeast slope of the Tehachapi Range, and the northwest border of the Antelope Valley, limestone outcrops extensively with northeast and southwest strike, dipping steeply into the mountains. The strike of these beds should carry them into the northwest corner of Los Angeles County, but no record can be found that they are now worked there.

In Bull. No. 38, p. 100, is a record of this limestone belt as worked in Kern County²⁶ in 1906. On page 367 of the same bulletin are data suggesting that it was, at that time, worked in Los Angeles County. In R. XIII, 1896, p. 629, is a note of a marble quarry in Antelope Valley, forty miles northeast of Lancaster. This is clearly incorrect, as the limestone above mentioned lies northwest of Lancaster.

Sandstone.

Chatsworth Park Quarry: (see Bulletin 38, p. 128). This property comprises 160 acres in Sec. 13, T. 2 N., R. 17 W., S. B. M. It is about $1\frac{1}{2}$ miles west of Chatsworth station, on the Southern Pacific Railroad and was formerly connected by a spur track with the main road. The locality is at the northeast end of the Simi Hills, a rugged range of sandstone strata, folded and faulted, their dip being plainly visible from the southward.

The stone of the quarry is arkose or feldspathic sandstone, rather fine-grained and heavily bedded. When fresh it is bluish-gray, but near the surface it weathers to a tawny color. This weathering extends to an irregular depth, but the demarcation between the weathered and fresh stone is very distinct. It is said, that when quarried for dimension stone, it can be split regularly along the run, but that when quarried for large blocks, as done for the substructure of the San Pedro breakwater, it breaks along uneven surfaces. As shown by some samples it usually resists exposure to the atmosphere in a satisfactory manner.

Near Garvanza, on N. Avenue 64, is the Church of the Angels, built in 1887, of the tawny-colored stone, which as yet shows no signs of deterioration.

In Los Angeles, corner of Fifth and Hill streets, is the house of the California Club, built of an olive-gray stone from the Chatsworth Quarry, but much stained by the leaching of soluble salts. Christ Episcopal Church, corner Twelfth and Flower streets, Los Angeles, is constructed of Chatsworth sandstone and also the city police station and jail on First Street, near Hill, and the Southern California Edison Company's building, East Fourth Street, near Main. A few private residences also have been built of this stone. At the shore end of the

²⁶See, also, Report on Kern County, 1915.

Southern Pacific Railroad pier at Santa Monica, some of this stone was used for rip-rap. Below high water level, where kept moistened by seawater, it remains quite hard, but above high-water mark, the exposed stone is rather soft and somewhat disintegrated.

The geologic age of the rock in this quarry is Upper Cretaceous or Chico, as mapped on Plate III of the folio accompanying Bulletin No. 69 of the State Mining Bureau.

The quarry was opened by the **California Construction Company**, which (about 1900) took the contract for building the San Pedro breakwater. At present the property is held by the Los Angeles Trust and Savings Bank as trustees for creditors of the California Construction Company, which has forfeited its corporate rights through non-payment of taxes, but it is now represented by the president, W. N. Hamaker, care of First National Bank, Los Angeles.

No rock has been quarried here for years, the quarry having been dismantled and its equipment and spur track removed.

Judging from examples of this sandstone in use, it is an important building stone, and it is to be hoped that the quarry may again be opened.

Serpentine and Steatite.

(Report X, p. 280; R. XII, p. 402; R. XIII, p. 639; Bull. 38, p. 147.)

On Santa Catalina Island, which is owned by the **Banning Company**, 594 Pacific Electric Bldg., Los Angeles, is a deposit of serpentine, formerly worked commercially under lease by F. C. Carey, 772 San Fernando Street, Los Angeles. The deposit is about a mile from Empire Landing on the north shore of the island and in a depression known as Potts' Valley.

The rock is fibrous in structure but takes a fine polish. There are two varieties, hard and soft. The soft variety may be sawed into slabs of any length. The hard variety is worked with ordinary stone-cutter's tools. This stone has been used in several buildings in Los Angeles for ornamental, sanitary and electrical purposes, also for lining fireplaces. The dark green columns at the entrance to the Henne Building are of this material. Sanitary slabs and electrical insulators manufactured from this stone are said to give great satisfaction. The soft variety was supplied in slabs one inch thick f. o. b. Los Angeles, for 75 cents a running foot. The hard variety was supplied in similar slabs at the rate of \$2.50 a running foot. The quarry has not been worked since 1913.

Near the south side of the isthmus on this island there is also a large body of steatite. It is said that about 400 tons of this rock were supplied every year to plasterers, soap factories, druggists, and foundry-men, but it has not been worked for about eight years.

Trachyte.

This volcanic rock, consisting chiefly of orthoclase feldspar, has been quarried on Santa Catalina Island, between Avalon and Empire Landing, according to the following note²⁷ made in 1894.

“**The Lang Quarry** is situated on Santa Catalina Island. It is said that although this stone is admirably suited for building purposes, the greatest demand for it has been as rubble rock, for use in railroad construction and harbor improvements. It is stated that 150,000 tons of this rock have been used during the last fifteen years. This rock can be supplied f. o. b. at Los Angeles, at the rate of from \$3.00 to \$4.00 a cubic yard.

As stated in Bulletin 38, p. 155, trachyte from this quarry was used in the old breakwater between Terminal Island and Deadman's Island and, to a small extent, in the great government breakwater at San Pedro, but blocks of sufficient size were difficult to obtain.

Crushed stone and sand.

The extended and ever increasing use of concrete for buildings and pavements makes the supply of crushed stone a matter of great importance. The stone chiefly crushed in this county for concrete is granite, of which boulders and cobblestones, in immense numbers, are distributed widely over the river washes which form where the mountain streams emerge from their rocky cañons, bearing along, in their torrential flow, great quantities of fragments from the cañon walls. So, it has long been a custom to install crushing and screening plants on these river washes to separate the sand from the cobbles and crush the latter, thus providing two of the most important constituents of concrete. Such crushing plants are operated on the Pacoima, Tujunga, Arroyo Seco, and San Gabriel washes by various companies which will be mentioned in detail. The economy of this procedure is obvious, as the cost of quarrying the rock from its native ledge is wholly eliminated, the expense of handling small boulders and cobbles being very trifling.

Rock crushing plants.

The largest plants near Los Angeles are operated on the wash of the Gabriel River. Two of these belong to the **Pacific Rock and Gravel Company**, 498 Pacific Electric Bldg., Los Angeles, W. L. Hodges, president, A. C. Stone, secretary. One is west of Azusa, near the tracks of the Pacific Electric Railway where the company controls 2500 acres, and the other two and one-half miles southwest, near the tracks of the Santa Fe Railway. This last, which was erected and formerly operated by the San Gabriel River Rock Company, is now being dismantled owing to damage from the floods of January, '16, and is

²⁷R. XII, p. 404. See, also, R. X, p. 279.

being reinstalled at a safer distance from the present river channel. A third plant is operated on the same wash near Baldwin Park (see Photo No. 1) by the **Russell-Greene-Foell Company**, of 814 Higgins Bldg., Los Angeles. This corporation also has a plant at Declez, San Bernardino County.

A few miles northwest of Los Angeles, in the San Fernando Valley, is the crushing plant formerly operated by the Tujunga Rock Company. This plant adjoins the tracks of the S. P. R. R., near Roscoe Station, in T. 5 N., R. 14 W. It is now controlled by the **Los Angeles Stone Company**, mentioned below. The output is sand, gravel and crushed stone, amounting to 1500 tons per day.



Photo No. 1. Rock crushing plant of Russell-Greene-Foell Co., in the San Gabriel River wash near Baldwin Park. Photo by Walter W. Bradley.

In Pasadena the **California Rock and Gravel Company** operates a crusher at Lester Ave. and Arroyo Seco. Quite near is the plant of the **Baldwin Construction Company**.

On the same arroyo in Pasadena, near the Ostrich Farm, is a small crushing plant operated by **W. W. McGregor**.

In Los Angeles a rock crushing plant is operated on the gravels of the Arroyo Seco by the **Los Angeles Rock and Gravel Company**, at Avenue 35 and Pasadena Ave.

Robert Beyrle formerly operated a crusher at 462 Avenue 20, and at N. Avenue 19 and Arroyo Seco, is a small crushing plant operated by the **City of Los Angeles** for street repairs.

At 26th and Alameda streets the **Consumers Rock and Gravel Company** produce sand and gravel from what was once a river bed. No crushing plant of importance is operated.

A similar business is conducted near by, at 2599 E. 26th Street, by the **Western Rock and Sand Company**.

Northwest of Glendale, between Montrose and La Creseenta, on a wash of granite boulders brought down by a stream, flowing from a cañon, in the San Gabriel Range, two miles west of the Arroyo Seco, is a crushing plant erected about 1914, but not now in operation.

Crushing plants operated in connection with quarries are few in this county. The following are, however, of consequence:

On the east slope of Brush Cañon, near Hollywood, a crushing plant is operated on a crystalline rock by the **Los Angeles Stone Company**, 1316 Baker-Detwiler Bldg., Los Angeles, H. S. Feraud, president, Geo. H. Clark, secretary.

The product is crushed stone and is used mainly for concrete. The capacity of this plant is 1000 tons per day.

This company, through an allied corporation, the **Acton Rock Company**, also operates an extensive plant near Acton on the S. P. R. R. where a crystalline rock is quarried and crushed.

At San Dimas a crushing plant was formerly operated by the San Dimas Rock Company, but this is now controlled by **Los Angeles County** and used to give employment to prisoners in the county jail.

The **San Fernando Rock Company**, unincorporated, 1006 Wright & Callender Bldg., Los Angeles, H. S. Wood, owner, operates a crushing plant near San Fernando on the wash of Pacoima Creek. The plant is on the northeast side of the S. P. R. R. tracks about one-third mile southeast of San Fernando Station. The material crushed is granitic boulders and cobbles brought down from Pacoima Cañon in the San Gabriel Range.

H. O. Richwine of Gardena has a gravel pit at Bixley, and a sand pit at Redondo, from which a small tonnage is taken annually for local use in concrete.

Lime.

Owing to the scarcity of limestone in this county, little of this building material has been produced and none is being made at present from local rock. One outcrop near Spadra was formerly worked and a lime kiln operated there, by the Pomona Lime Company, now defunct. Some lime has been made in Los Angeles from limestone brought in by the railroad.

In the VIIIth report of the State Mineralogist, pages 340-341,

printed in 1888, Mr. W. A. Goodyear, who wrote in 1872, described some occurrences of limestone near San Fernando as follows:

"In the Pacoima Cañon, on the northeastern side of the San Fernando Valley, some three and one-half miles from San Fernando Station, and eight hundred to one thousand feet above the valley, Dr. J. S. Turner has a limestone quarry in the granite. The lower foothills of the mountains are here unaltered shales and sandstone, dipping southerly. The limestone, at the quarry, is highly crystalline. It seems to vary much in purity, containing in places considerable disseminated epidote, and being also here and there irregularly and capriciously intermixed with granite. To produce a uniformly good quality of lime from this quarry will require a careful sorting of the rock. Yet, some of it seems very pure, and samples from the top of a freshly burned kiln slaked quickly and thoroughly, yielding, to all appearance, a beautiful quality of lime. There is no timber here, and the fuel hitherto used for burning the lime was sagebrush. The granite here also varies much in character. Some of it is very feldspathic, with very little mica, and much magnetic iron.

"Some three or four miles southeast from here, and only two miles northwest of Pacoima Cañon, are the limestone quarries of Mr. Wilson, who has been burning more or less lime here for a number of years. The limestone burned here is all crystalline and a heavy body of it is enclosed in mica schist and gneissoid rocks. The latter are often curiously intermixed with the limestone itself in ways not easily explicable, the whole being very highly metamorphosed. Neither epidote nor graphite was seen here." No lime has been made here for many years.

At the present time the demand for lime in Los Angeles is in part supplied by the Los Angeles Lime Company, H. de Garmo, president, and L. A. Stahl, secretary. This corporation has its warehouses at 1522 E. Scherer Street, Los Angeles, where they sell lime, made from limestone outside of the county. Three sources of supply are drawn upon: Grand Cañon, Arizona; Tehachapi, Kern County; and Colton, San Bernardino County.

Portland cement.

This important building material is not made in Los Angeles County. The great plants at Riverside, Colton and Oro Grande, make it unnecessary to establish a plant in this county. The County Board of Supervisors, however, controls the large plant built by the city of Los Angeles at Monolith, Kern County, to supply the construction of the new city aqueduct, and this plant is in operation at present.

Artificial stone.

As the methods of constructing buildings improve, much attention is given to replacing cut stone blocks and slabs by moulded blocks of artificial stone made of Portland cement and sand or crushed rock. Thus are made a great variety of articles used in building, bricks, ashlars, window sills, lintels, copings, columns, plinths, and many other objects of attractive appearance and durability, at a cost far below that of cut stone.

Color and texture is given to these building units by using suitable varieties of crushed rock, marble giving a white color, granite an agreeable gray and red jasper contributing a warm reddish color.

In Los Angeles, the chief manufacturers of such products are the **Stengel and Krebs Stone Company**, 252 W. Thirty-seventh St., and the **Tay-Mac Company**, 1313 E. First St.

At Long Beach are the **H. H. Hamilton Art Stone Company**., 745 Obispo Ave., and **Harrison McLintick**, 1408 Hellman Ave.

The **Alpine Plaster Company** of 1503 Alameda St., makes a business of preparing the materials which are mixed with Portland cement to form artificial stone. At present this company grinds silica, granite, and marble, which are consumed in the foregoing industry.

A similar business is transacted by the **Pacific Mineral Products Company**, of 201 N. Avenue 19. This corporation grinds granite, jasper, silica and marble for artificial stone and manganese for glass making.

CLAYS.**Brick Clay.**²³

The brick clay deposits within the limits of Los Angeles and vicinity consist principally of loam (clay mixed with sand), which contains numerous inclusions of pebbles. These clays are mostly marine deposits of the late Pleistocene, formed when the land was depressed below its present level. In the northeastern part of the city, the clays are underlain by sand. East of the Los Angeles River, on Boyle Heights, near Boyle Ave. and Seventh St., clay forms an upper stratum, from 5 to 10 feet thick, containing numerous lenses of sandy material. It is underlain by sand and gravel. Northeast of this, near the corner of Stephenson Ave. and Mott St., a bank of clay 25 to 50 feet high, was formerly worked by the Southern California Brick Company. Southwest of the city, near Inglewood, is a clay, possibly of fresh water origin, containing lenses of sand and fine gravel, underlain by coarse gravel. On Pico Heights, in the western part of the city, is an extensive clay deposit, 25 feet thick, and once worked at several points. West of Los Angeles, in Santa Monica, about one mile

²³Bull. No. 33, pp. 243-249.

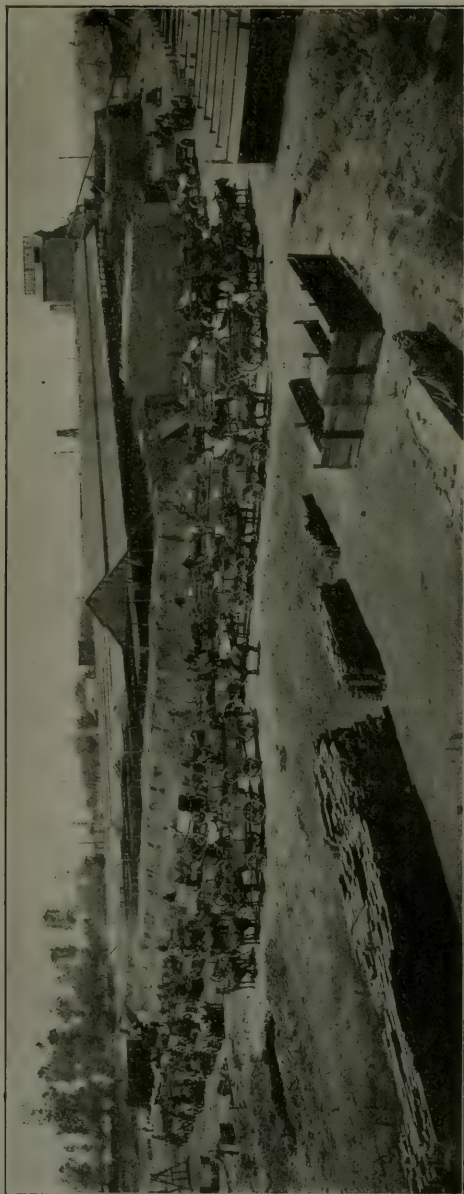


Photo No. 2. Plant of the Simons Brick Company, Boyle Heights, Los Angeles.

from the ocean shore, is an extensive deposit of high-grade clay, which is probably underlain by gravel. This is worked by the Simons Brick Company, and the Los Angeles Pressed Brick Company. In Chavez Cañon, north of Sunset Boulevard, a bank of Puente shale, over 100 feet high, is worked by the Los Angeles Brick Company.

This shale occurs in thin beds dipping south into the hill. Some of them are highly plastic, separated by thin beds of sand, and make very workable material.

The clay deposit near Inglewood is northwest of the Santa Fe Railroad station. It was formerly worked for brick by the Simons Brick Company and other corporations, but is now abandoned.

Among the leading manufacturers of brick in Los Angeles County are the following:

Simons Brick Company, W. R. Simons, president, L. Simons, secretary, 125 West Third St., Los Angeles. This company manufactures common building brick and pressed brick, and operates four brick-yards, the combined capacity of which is 145,000 brick per day. From 175 to 200 men are employed.

One yard is at 1117 South Boyle Ave., Los Angeles (Photo No. 2). This occupies 24 acres. The clay bank worked here forms the upper portion of the Boyle Heights Terrace formation. It is excavated by a steam shovel. The bricks are made in stiff-mud and soft-mud brick machines, air-dried, and burned in open kilns, using oil as fuel.

Another yard of this corporation was formerly on South Franklin Ave., Pasadena, but this is not now in operation, being used only as a distributing plant. The largest plant of this corporation is at Simons' Station on the A., T. & S. F. Ry., about four miles south of Whittier. This occupies 150 acres. A shipping station is on W. Sixteenth St., near Arlington St., Los Angeles.

A third is operated in Santa Monica at Colorado Ave. and Twenty-sixth St., and a fourth at El Centro, Imperial County.

Los Angeles Brick Company, 503 Security Bldg., Los Angeles, M. S. Hellman, president; G. D. Cadwalader, secretary. This company has three yards.

One yard is corner of Mission Road and Marengo St., near the County Hospital. The clay is from 25 to 30 ft. thick, underlain by five or six feet of sand. It is ground in a pug-mill and then passes through a roller crusher. The bricks are made in a Potts' soft-mud machine, driven by electric power; air-dried and burned in a continuous kiln—an ellipse, 175 feet long and 52 feet wide; the outside ring, 12 feet wide, and the chambers (distance between the flues to the smoke-room near the bottom), 12 feet long; the firing flues 4 by 4 inches, are placed in rows $3\frac{1}{2}$ ft. interdistant, five in a row. The

fuel used is fine coal. The bricks can be burned in from fifteen to seventeen days. Capacity 25,000 to 30,000 brick per day.

A second yard is in Chavez Cañon, west of Adobe St. Some years ago this company had two other yards here which have been dismantled. The clay used is the Puente shale forming the southwest bank of the cañon, as above described. This material is ground in a dry-pan grinder of special construction. The ground shale falls on a belt conveyor, passing under the center of the grinder and delivering it to another belt, which, in turn, conveys it to the brick machines. In this way the scrapers ordinarily used under the grinder are omitted, reducing the amount of power required and the cost of repairs in handling this rather stiff material. In one yard the bricks are made in a stiff-mud brick machine, having a 12-foot pug-mill combined with a 22-brick wire cutter. In the other two yards, the bricks were made in Potts' soft-mud brick machines. The bricks are dried in steam-heated driers, and burned in three continuous kilns and in open kilns. The motive power is furnished by steam. The capacity of this yard is 90,000 bricks per day.

The third yard, which is now idle, is on Seventh St., near Boyle Ave. The clay was obtained from the upper part of the Boyle Heights Terrace formation. The bricks were formerly made in a Potts' soft-mud brick machine, air-dried, and burned partly in open kilns, using oil as fuel.

Los Angeles Pressed Brick Company, Howard Frost, president, H. P. Potter, secretary, 145 South Broadway, Los Angeles. At Santa Monica (See Photo No. 3), the territory of this company covers about 60 acres, of which about one acre has been excavated. The clay deposit is from 10 to 36 feet thick, dipping northwest, and increasing in depth in that direction, presumably underlain by gravel. The clay is of better quality than in most of the deposits near Los Angeles. It makes good, hard brick, being treated in dry-pan crushers and a 14-foot pug-mill. The bricks are made in a special Giant, stiff-mud, 18-brick, wire-cutting machine. They are dried in tunnel driers, heated by the exhaust from the downdraft kilns 30 feet in diameter, with eight or ten firing flues, using oil as fuel; also in open kilns. The downdraft kilns will burn common bricks in six days and hard bricks in seven to eight days. This plant manufactures building brick, hard brick (vitrified), repressed brick, paving brick, paving blocks, and sewer pipe. The yard is equipped with a 300-h. p. boiler and a 250-h. p. engine. Its daily capacity is 90,000 bricks. (See also under Pottery.)

K. & K. Brick Company, Keller and Kubach, Room 731, Merchants National Bank Bldg., Los Angeles. Their clay bank covers 38 acres on Bishops Road. The bricks are made in a Raymond brick machine

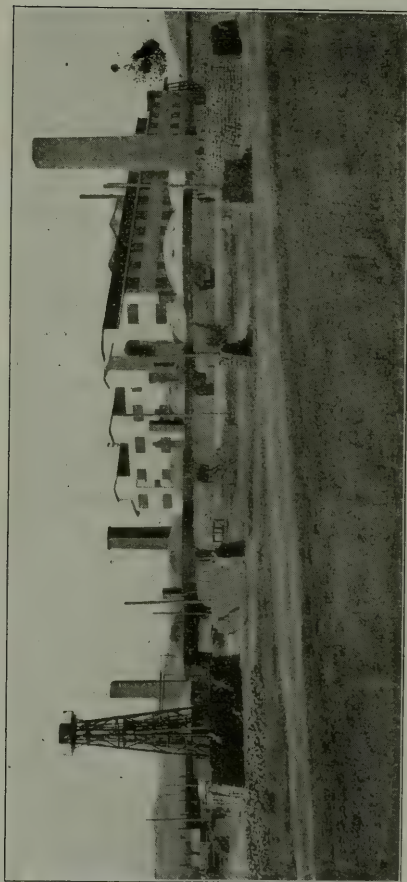


Photo No. 3. Santa Monica plant of Los Angeles Pressed Brick Co. Cut by courtesy of
Los Angeles Pressed Brick Co.

and Tate wire-cutter, dried in a steam-heated drier, and burned in open kilns, using oil as fuel. The yard is equipped with a 250-h.p. boiler and 200-h.p. engine. Capacity 74,000 bricks per day. Employs 35 men.

Standard Brick Company, 101 and 102 Stimson Bldg., Los Angeles, R. G. Simons, president, H. W. Simons, secretary. This company manufactures common brick and repressed brick, at its plant east of the Los Angeles River, corner Soto and Lugo streets. The clay is ground in a dry-pan crusher. The bricks are made in a Potts' soft-mud brick machine, air-dried, and burned in open kilns, using oil as fuel. The yard is equipped with a 30-h.p. engine and boiler. Capacity 36,000 bricks per day. Thirty-five men employed.

Other brick makers formerly active in Los Angeles, but not now operating are:

Berg & Oby, College and New Depot Sts.

J. C. Hadacheck, 4144 W. Pico St.

Hubbard and Chamberlain, La Brea Ave. near Wilshire Blvd.

J. Jensen, W. Pico St.

Southern California Brick Co., Stephenson Ave. near Mott St.

Inglewood Brick & Tile Co., yard, Inglewood.

Furlow Pressed Brick Co., 2001 San Pedro St., Los Angeles. Sand-lime brick.

L. A. Paving Brick Co., yard at Montebello, but not in operation.

Mulford Vitrified Paving Brick Co., yard at Montebello. Idle.

Outside of Los Angeles City, but within the county, are the following brick plants:

Long Beach Brick Co., 215 E. First St., Long Beach. President, J. T. Parker. Yard at E. Seventh St. and Ximeno Ave. Idle.

Long Beach Brick Works, Masonic Temple, Long Beach. Richard Loynes, secretary, yard Fourteenth St., cor. Chestnut Ave. Idle.

Lordsburg Brick and Construction Co., J. D. McCoy, Mgr., Lordsburg.

Pomona Brick Co., W. W. McMullen, Mgr., Pomona.

Pacific Mfg. & Supply Association, P. McGaffey, secretary, 111 W. Sixth St., San Pedro. Idle in 1915.

Pottery clay.

But little of this material is known in Los Angeles County. In past years a plastic clay, burning red, and serviceable for making flower pots, ollas, and such products, was found on Boyle Heights near the intersection of Stephenson Ave. and Mott St. Clay from this deposit has been used in several small potteries (see C. S. M. B.

Bull. 38, pp. 213-217). At present the chief local supply of this material is from the pits of the Simons Brick Company, near Santa Monica, which adjoin the tracks of the so-called Santa Monica Air-line Ry.

The following are some of the chief manufacturers of clay products, exclusive of brick, in and near Los Angeles, though some use other than local clays.

Los Angeles Pressed Brick Company, Howard Frost, president; H. B. Potter, secretary. Offices 145 South Broadway, main works at Alhambra Ave. and Date St., Los Angeles.

This corporation has a large and well-equipped factory for making pressed building brick, roofing and other ornamental tile, fire brick, and refractory linings of different kinds. The Los Angeles plant has been in operation for several years, and the business has been constantly increasing from the start, as there is a very active demand for high-grade brick. Among the prominent buildings on the Pacific coast which are faced with this company's enameled brick are: Central, Los Angeles Investment, Federal Bank, Union Oil, Hollingsworth, Marsh-Strong and Washington Building in Los Angeles; American National Bank Building and St. James Hotel, San Diego; Hewes Building, San Francisco; and Hotel Utah, Salt Lake City. The company is meeting the demand for refractory furnace linings, caused by the increased use of oil fuel. They also make a radial interlocking brick for conduits. For refractory ware, the company at times uses a black flint fire clay from near Gypsum station, Orange County, similar to that from McKnight's clay pit near Corona. The bricks and tiles made from this clay are said to give good satisfaction. The building bricks, interior bricks, and sewer pipe, are made of white clay from the company's pits near Alberhill, Riverside County. This company has also a large plant mining local clay for the manufacture of common brick, hollow tile, sewer brick, roof tile, drain tile and sewer pipe, at Colorado Ave. and Twenty-fifth St., Santa Monica. The combined capacity of its two plants is 20,000,000 bricks per year. A third plant is in operation at Richmond, Contra Costa County.²⁰

The Independent Sewer Pipe Company continues the business of the Western Art Tile Works, successor to the Pacific Art Tile Company. This company has a commodious and well-equipped factory on the Southern Pacific Railroad at Tropico, 6 miles north of Los Angeles, and has been in active operation since August, 1904, until quite recently, being at present idle.

The company manufactures floor, wall, mantel and art tiles; plain, ornamental, and embossed vitreous china, sanitary ware, plumbers'

²⁰Since the above was written, a fourth plant is being built at Alberhill, Riverside County, *q. v.*

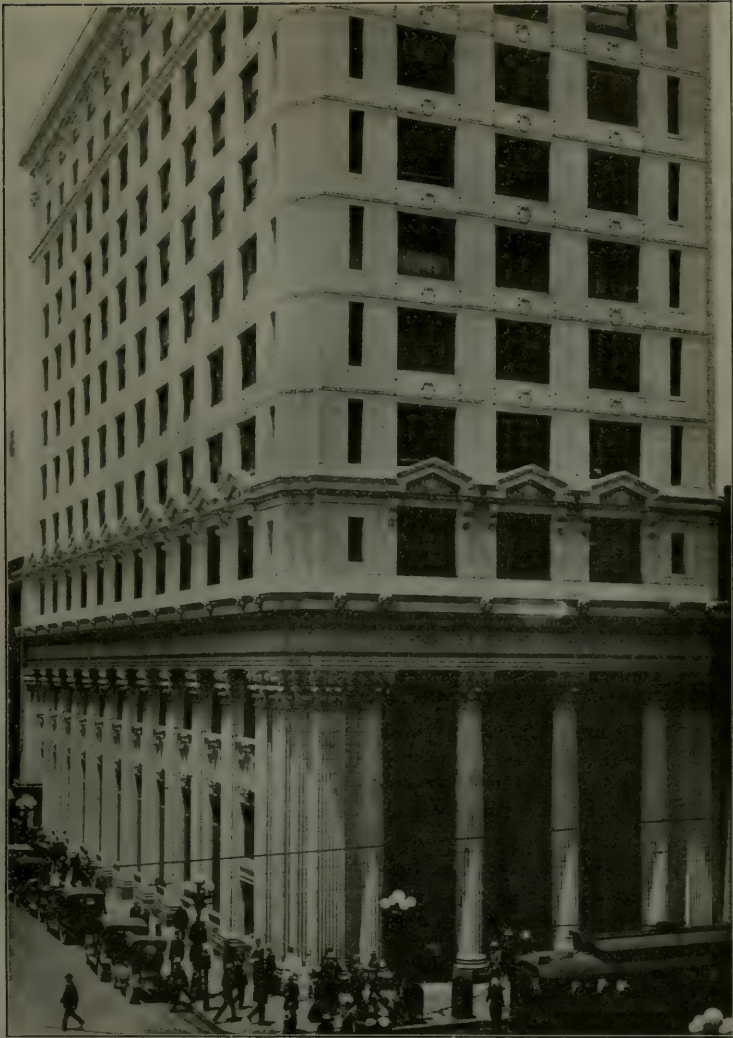


Photo No. 4. Los Angeles Trust & Savings Bank Building. Architectural terra cotta by Independent Sewer Pipe Co. Photo by Walter W. Bradley.

earthenware and other clay goods. The Los Angeles Trust & Savings Bank Building, cor. Sixth and Spring Sts., Los Angeles (Photo No. 4), is finished with architectural terra cotta from this plant.

The factory started about 1904 as the Pacific Art Tile Company and the works were closed for several weeks during the summer of

1904. It is said to be the only factory of its kind west of the Rocky Mountains. Many of its products require the finest quality of clays, which at present are imported from Europe. Ground silica and feldspar are also shipped from the eastern states. These materials occur in California, but the known deposits are so remote from the railway that it has been found to be cheaper to import them than to mine the home products.

One of the largest manufacturers of clay products is the **Pacific Sewer Pipe Company**, E. M. Durant, president, Arch Douglas, secretary, with offices at 825 E. Seventh St., Los Angeles. This corporation controls six plants, three in Los Angeles County and three in Riverside County. One plant is at 423-527 N. Avenue 26 Los Angeles. This was built and formerly operated by the Los Angeles Stoneware and Sewer Pipe Company, which was absorbed by the Pacific Sewer Pipe Company.

A second is on Central Ave., Los Angeles. This was formerly owned and operated by the California Clay Manufacturing Company of 235 Los Angeles St., and was purchased by the Pacific Sewer Pipe Company.

A third plant is at Los Nietos, about two miles SW. of Whittier.

Two other plants were at Corona, one being now dismantled, and a sixth is at Terra Cotta.

This corporation manufactures vitrified sewer and water pipe, drain tile, terra cotta chimney pipe, flue linings, enameled brick, pressed brick, fire brick, conduit, stoneware, etc.

St. Louis Firebrick and Clay Company, unincorporated, Jos. Mesmer, owner, — Fuller, manager. Works, 2464 E. Ninth St., Los Angeles. Uses clay from McVicar's pit near Corona, Riverside County, in sec. 4, T. 4 S., R. 7 W. Manufactures pressed brick. The bricks are made in a 4-mold Berg brick machine, and burned in down-draft kilns, using oil as fuel.

Minor branches of the manufacture of clay products are conducted by the following:

J. A. Bauer Pottery Company, W. H. Brown, president, F. Anderson, secretary, 653 S. Griffin Ave., cor. Alhambra Ave., Los Angeles. They manufacture flower pots, ollas, etc., and use Santa Monica clay from Simons Brick Company.

Standard Pottery Company, W. H. Brown, president, F. Anderson, secretary, 653 S. Griffin Ave., cor. Alhambra Ave., Los Angeles. This company uses clay from Simons pits, Santa Monica. It manufactures flower pots, ollas, stove thimbles, etc. The clay is treated in a clay-grinder. The pots are made in a stamp pot machine, capacity



Photo No. 5. Hollow building tile used in wall construction. Cut by courtesy of Simons Brick Co.

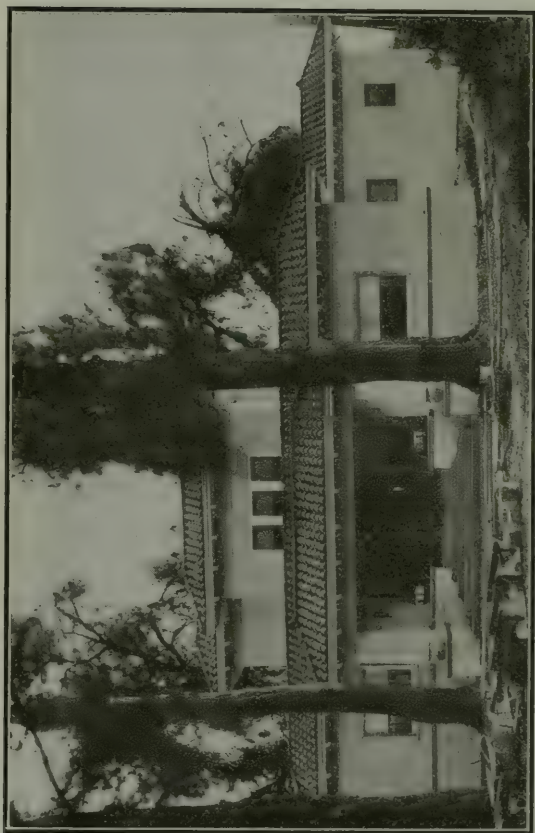


Photo No. 6. Mission style, burned clay roofing tile. Cut by courtesy of Simons Brick Co.

2000 pots per day. The plant is equipped with a 12-h.p. gasoline engine.

J. F. Tomaseck. Works, 882 E. Forty-eighth St., Los Angeles. Uses principally clays from Santa Monica. Manufactures earthenware, stove linings, flue thimbles, assayers' furnaces and muffles.

The **Simons Brick Co.**, described in the preceding pages under brick, also makes hollow building tile, roofing, and various other forms of ornamental tile. Photos Nos. 5 and 6 show the application of two of these products in structural work. The hollow building tile is fire-proof and makes a lighter weight wall than brick, and stated also to be both cooler in summer and warmer in winter than brick, owing to the interior air spaces. The mission style, burned clay roofing tile is not only picturesque and ornamental, but is peculiarly adapted to the climate of California, because of the absence of snow and frost.

COAL.

The only record of this fuel in Los Angeles County is found on page 204 of the Ninth Report of the State Mineralogist. The observer, Mr. E. B. Preston, in 1889, wrote as follows:

"About one and a half miles southwest from Newhall in some low-lying sandstone hills, a Mr. Brophy is mining for coal. He has started an incline shaft on one of the larger bituminous strata, dipping 25 degrees north. The strike is east and west. This stratum, in the end of the drift, is thirty-two inches thick, and above it is a layer of thirty inches of fire-clay. Toward the bottom of the drift the carbonaceous matter becomes more compact, assuming in places the appearance of lignite. They say they have had it tested and that it contains 72% of carbonaceous matter and 25% of ash."

No further work has been done on this deposit of carbonaceous material and it is probably of little value. The geologic formation at this point is the Fernando or uppermost member of the Tertiary as shown on Plate III of the folio accompanying Bulletin 69 of the State Mining Bureau.

No other occurrences of coal have been reported in this county, except in bluffs along the coast four miles west of Santa Monica where explorations were made in 1889.³⁰

FELDSPAR.

A single deposit of this mineral has been reported. It lies three or four miles northwest of Acton and belongs to **Geo. Duerhren** of that place. It is an orthoclase containing up to 14% potash, but is not being used commercially.

³⁰R. IX, p. 208.

FULLER'S EARTH.

This important material used for filtering and decolorizing oils, is a variety of clay and varies greatly in chemical composition.

It has not been found abundantly in Los Angeles County, and only one locality is known. This is six miles west of Saugus, in T. 4 N., R. 16 W. It is owned by **R. E. Overman**, 117½ Commercial St., Los Angeles.

GEMS.

Beach stones.

On some of the California beaches are found many interesting pebbles of whitish chalcedony that frequently have the appearance of a partial polish.

In Bulletin No. 37 of the State Mining Bureau, on page 71, Dr. Geo. F. Kunz described some occurrences in Los Angeles County.

About fifteen miles south of Los Angeles is Redondo, a well-known beach resort. Here are found many beautiful pebbles. It is the custom after each tide for visitors to search the beach in quest of these treasures, which are especially abundant north of the pier and as far as Playa del Rey. They are thought to come from a bed of sand and gravel in the vicinity. In 1901 several of these pebbles were found in an Indian grave near Redondo. Large quantities of these pebbles are gathered and sold to tourists. Chains are made by drilling the stones and stringing them on a flexible wire. They are also polished and set in rings, brooches, etc.

Besides the chalcedony pebbles are others in which red jasper is mixed with chalcedony. More striking than the others are the so-called flower stones. These appear to be fragments of a dark colored eruptive with very fine-grained or aphanitic base, in which feldspars have developed with a radial structure suggesting little flowers.

Another important pebble locality was formerly that known as Moonstone Beach, on Santa Catalina Island, but this is now exhausted. The pebbles were not moonstones but nodules of quartz weathered out of a rhyolite rock—composed of sanidine feldspar and quartz—while those of Redondo are agate and chalcedony, and doubtless came from some amygdaloidal rock, a reef of which may outcrop in the beach below low water mark, the pebbles being washed up by the waves.

Beach stones are collected, polished, mounted and sold by the following dealers at Redondo: S. B. Clem, Wm. Kern, Square Deal Gem Co.



Photo No. 7. Outcrop of graphite vein on Prince No. 1 claim of California Graphite Co.
Photo by Walter W. Bradley.

GRAPHITE.³¹

E. S. Bastin³² has the following to say, in part, on California graphite:

"The graphite deposits of Los Angeles and San Diego counties resemble the characteristic deposits of New York, Pennsylvania and Alabama in that the graphite occurs as crystalline 'flakes' disseminated through a schist. The flakes in the California graphite schists are, however, much smaller than those in the eastern occurrences, most of them not exceeding 0.25 millimeter in diameter. For this reason the problem of their concentration is entirely different from that of the eastern deposits, nor would the concentrate be adapted for use in the manufacture of crucibles or other refractory products, in which a coarse flake is essential. On the other hand, the percentage of graphite in the California deposits appears to be nearly twice that of most of the eastern deposits of flake graphite. Another advantageous feature is the absence or great scarcity of mica, a mineral which, because of its flaky character, is particularly difficult to separate from flake graphite.

³¹See Bull. 38, p. 280; also R. X, p. 282.

³²U. S. G. S., Min. Res., 1914, Pt. II, p. 164.



Photo No. 8. Tramway and graphite claims of California Graphite Co. Photo by Walter W. Bradley.

"The California properties present, therefore, a number of favorable features. The fineness of the graphite undoubtedly renders difficult its complete separation from the gangue minerals, but there should be no great difficulty in obtaining a partial concentrate sufficiently rich in graphite to serve for foundry facings, boiler 'compound,' and paint pigment, while at the same time conducting experiments with a view to securing a more perfect product. For the uses mentioned above the graphite would have to compete with Korean amorphous graphite, which can be bought in New York at from \$22.50 to \$25 a ton and on the Pacific coast at a still lower figure."

California Graphite Company, G. A. Skinner, president, P.O. Box No. 157, Saugus, Cal.; Los Angeles office, 506 Washington Bldg. This company has two groups of claims in Secs. 11 and 12, T. 6 N., R. 15 W., S. B. M., 18 miles from Saugus, in a branch of San Francisquito Cañon. The upper group consists of seven claims, named Prince No. 1 to No. 7, and a mill site, and there are two claims in the lower group. The vein as shown in the outcrop (Photo No. 7) is 8 ft. wide, striking north of east, and dipping at a rather steep angle. In Photo No. 8, this open cut may be seen at the head of the small ravine in the upper right-hand corner. This "vein" is in reality a graphite schist in a

granitic country rock; and is remarkably persistent in character and width. It was observed at points covering practically the full length of Prince No. 1 claim (1500 ft.), and is stated to be traceable throughout the length of five full claims, being opened up in a crosscut adit on No. 4, about 3000 ft. distant from No. 1. At one point there is a shaft down 64 ft., with a drift of 105 ft. The graphite on the upper claims is of the flake variety, while that on the lower group is amorphous.

According to Bastin:³³ "Microscopic study of samples from Prince No. 1 and No. 4 claims shows that nearly all of the graphite is in flakes 0.25 millimeter or less in diameter, although at the head of the wire tram on claim No. 1 schist carrying graphite flakes up to 1 millimeter in diameter was noted. The principal mineral of the graphite schist is a colorless amphibole, probably anthophyllite; other minerals in approximate order of abundance are quartz, feldspar, and pyrite, the latter in very small quantities. Determinations were made in the survey laboratory of the percentage of graphite in three samples collected by the writer from this property, with the following results:

Samples of Graphite Schist from Los Angeles County.

Sample	Percentage of graphite
Composite sample of graphitic schist from many different localities on Prince No. 1 claim	7.29
Composite sample taken at intervals of about 1 foot across 50 feet of graphitic schist exposed in crosseuts in tunnel on Prince No. 4 claim	12.00
Sample of richest type of graphitic schist from same tunnel as No. 2	17.48

"Large samples from Prince No. 4 claim sent to Germany for experimental treatment are said to have concentrated 6 into 1, yielding a concentrate of lubricating grade."

An aerial tramway, 1500 ft. long, with buckets 200 ft. apart, connects the open cut with the mill. It is operated by gravity, there being a difference of 500 ft. in elevation between the terminals. The mill, with a capacity to treat 10 tons per day, is equipped with a 30-h.p. gasoline engine, rolls, and two buhr mills. Several different methods of concentration were tried—water, air, and oil—with indifferent success until recently. The main difficulty seems to be the elimination of the fine clay. Mr. Skinner states that he has finally evolved a dry process which yields a very clean product (samples of which have been placed in the Museum of the State Mining Bureau); and he expects to resume operations by July 1st (1916). The haul to Saugus can be made for \$2.50 per ton. There are several good, fresh-water springs on the property.

³³loc. cit., p. 165.

At one point on Prince No. 1 claim, an outcrop of magnesite about 3 ft. wide was observed. It appears to be in a local area of serpentine; but as no work had been done on it, its extent was not determinable at the time of our visit.

Graphite also occurs in several points in Los Angeles County, but not yet developed commercially. A deposit of crystalline graphite occurs in T. 7 N., R. 15 W., S. B. M., near Elizabeth Lake.

In Sec. 4, T. 1 N., R. 13 W., S. B. M., in the Verdugo Hills, 12 miles northeast of Los Angeles, a stratum of graphite 20 ft. wide is found in mica schist. It is amorphous and soft, which renders the separation difficult and expensive. This soft graphite can only be used for paint or foundry facing (see XIth Report State Mining Bureau, p. 207).

Graphite occurs in Tujunga Cañon, four miles from its mouth, and is found also at the head of San Francisquito Cañon, in S. $\frac{1}{2}$ Sec. 11, T. 7 N., R. 16 W. The vein runs across to Charlie Cañon.

GYPSUM.

(Hydrous calcium sulphate.)

The chief deposit of this material known in this county is near Palmdale on the S. P. R. R.

It was formerly worked by the **Alpine Plaster Company** of Los Angeles and Pasadena, and was thus described in Bulletin No. 38, pp. 284-286.

"The gypsum outcrops for several miles east and west of Palmdale, in the low foothills along the south side of the great Antelope Valley, interstratified with conglomerate, sandstone and shale. The general dip of the strata is to the south. So far as known, the total thickness of the gypsum beds has not yet been ascertained, but there is sufficient showing, on the outcrop, to promise a supply for many years to come. Part of the gypsum occurs in fibrous layers one-eighth to one-half of an inch or more thick, alternating with thin layers of clay and shale. The banded layers are in places rather sharply folded, and in places faulted. In other places, along the outcrop, the gypsum is more massive, shows little crystallization, and contains more or less white and yellow clay diffused through its mass."

The better grades of the gypsum quarried, it was stated, ran over 80% in calcium sulphate. The workable beds varied in thickness from 2 to 30 ft. or more. The quarry, in July, 1904, contained from 4 to 5 feet of commercial product, with almost no stripping. All of the quarrying so far has been done on the outcrop along the brow of a low hill. A dozen or more small quarry openings had been made. The gypsum was manufactured into plaster at the factory, which was located near Palmdale, on the Southern Pacific Railroad. The material was transported in wagons from the quarries to the mill.

The mill was in operation for three years, from 1901 to 1904, manufacturing two grades of plaster. No. 1, white for finishing; No. 2, wall plaster. The product was principally used in Los Angeles and Pasadena, and the demand was said to be steadily increasing. There were two pots in operation with a capacity of 40 tons of plaster per day, using oil as fuel. This is now dismantled. This company now has a plant at Fifteenth and Alameda Sts., Los Angeles, where it prepares material for artificial stone. (See also XIth Report of the Cal. State Mining Bureau, p. 248; XIIth Report, p. 324; XIIIth Report, p. 504.)

The Fire Pulp and Plaster Company, 750 South Alameda St., Los Angeles, formerly owned a gypsum deposit at the head of San Francisco Creek, 13 miles from Casteca. The gypsum was of good quality; it occurred, however, in relatively small pockets and layers within the inclosing country rock. This company is now out of business. (See Bull. 38, p. 285.)

About two miles north of Lang, a station on the Southern Pacific Railroad, in Sec. 30, T. 5 N., R. 14 W., S. B. M., there was a deposit of gypsum nearly 8 feet wide and almost perpendicular. (See IXth Report State Mining Bureau, p. 195.)

In Bulletin 413 U. S. Geological Survey, pp. 29-31, is a detailed description of some of these deposits, written by Frank L. Hess, which is so complete that it is here given in full:

"At Palmdale, Los Angeles County, a station on the Southern Pacific Railroad, sixty-nine miles north of Los Angeles, both efflorescent and interbedded gypsum deposits are found, about $1\frac{1}{2}$ miles southwest of the railroad, on a low ridge along which runs the line surveyed for the aqueduct to bring water from Owens River to Los Angeles. A considerably decomposed granite occupies a portion of the outer side of the ridge and on it, in places, is a basal conglomerate containing large boulders of granite. Over this is a series of gypsiferous soft sandstones and shales. With the shales thin strata of gypsum are interbedded, and, on these sediments, gypsite has formed in deposits similar to those farther north, along the Coast Range. The gypsum deposits occur through a length of about a mile or a mile and a half along the top and sides of the ridge. In places they have been washed down the sides of the hill, so that they cover the granite below. Two companies, the Fire Pulp Plaster Company and the Alpine Plaster Company, are working the deposits, and each has a plaster mill at Palmdale, to which gypsum is hauled in wagons.

"The gypsite is two to ten feet thick and is irregular in distribution and purity. At a number of places it occurs in small valleys in which it has been deposited by freshets and brought down from the low hills above. In places, it is much stained with iron, which has been brought in since the deposition of the gypsite, as shown by stains following

watercourses through the gypsite. The gypsite is ordinarily overlain by 6 inches to one foot of dirt, and excavations from which it is removed, cover from a few hundred square feet to an acre or more in extent. The thickest deposits are on the brows of spurs of the main hill, where they reach a thickness of nine feet. The gypsite is creamy white in color.

"A partial analysis by Geo. Steiger of a specimen from one of these deposits which was being worked February 1, 1907, gave the following results:

Partial Analysis of Gypsite from Alpine Plaster Company's Deposit, Palmdale, Cal.

Lime	32.8
Sulphur trioxide (SO ₃).....	45.3
Water driven off at 60° C.....	.1
Water driven off at 300° C.....	20.5
Chlorine (Cl) .....	.06
Iron oxide (Fe ₂ O ₃).....	.30

"This is apparently equivalent to about 77.3 per cent gypsum. The interbedded gypsum deposits also are worked by the Fire Pulp Plaster Company.³⁴ The beds are not at all uniform in quantity of gypsum carried, and can be worked only in places. The dip is uneven, but is about 45° W. The gypsum strata reach in places a thickness of 3 or 4 inches, and all contain more or less clay. The rock is shot down with dynamite and then handled with forks to separate the gypsum from the clay. Some hand picking also is necessary.

Partial Analysis of Rock Gypsum from Palmdale, Cal.

Lime	27.5
Sulphur trioxide (SO ₃).....	33.5
Water driven off at 60° C.....	.8
Water driven off at 300° C.....	15.6
Chlorine	Trace
Iron oxide (Fe ₂ O ₃).....	1.3

"The specimen apparently carries 72.1 per cent of gypsum.

"Similar beds outcrop at a point about $\frac{1}{2}$ mile northwest of the workings just described. They have been worked to a certain extent and a face 25 feet high and 50 feet broad is exposed in an excavation in the side of the hill. The beds here dip northeastward. Other deposits of gypsum are said to occur in the higher hills 6 or 7 miles south of Palmdale. Similar interbedded gypsum deposits are reported to occur at Lang, southwest of Palmdale, and the deposits at Castaic are said to be in the same rocks."

³⁴Now suspended.

INFUSORIAL OR DIATOMACEOUS EARTH.

(Bulletin No. 38, pp. 291-292.)

This important material is composed of the siliceous shells or outer skeletons of minute forms of vegetable and animal life which inhabit lakes and ponds and also the ocean, at the bottom of which extensive deposits are formed.

Its cellular and porous character gives it great absorbent powers and so it is used largely as an absorbent of nitroglycerine in making dynamite. As it mainly consists of silica it has some value as an abrasive and is used to some extent as a polishing material.

None has been produced commercially in Los Angeles County, but a few localities have been noted.

The Banning Company, 504 Pacific Electric Bldg., Los Angeles, which owns Santa Catalina Island, has there a deposit of infusorial earth 75' thick, from which considerable amounts have been shipped. (See XIIth Report of the State Mining Bureau, p. 406; XIIIth Report, p. 643; Bulletin No. 38, p. 363.)

On the **Palos Verdes Ranch**, which includes the San Pedro Hills, are several exposures of infusorial earth of a very chalky character. None, however, has been developed to any extent.

At Point Duma, northwest of Santa Monica, there is said to be a large deposit of infusorial earth. (See State Mining Bureau IXth Report, p. 208.)

Another deposit, as yet unused commercially, is in the bluffs three miles south of Redondo as reported by Mr. E. B. Preston.³⁵

Still another deposit of this material has been observed between Los Angeles and Pasadena near Bairdstown, but it is idle, commercially.

MAGNESITE.

(See California Graphite Co., under "Graphite.")

MINERAL PAINT.

Of this material there is no production in this county except as noted under Borax, but, as reported by Mr. E. B. Preston,³⁶ highly colored clays, fit for use as pigment, occur in the coast bluffs, two or three miles north of Redondo. These beds have never been worked commercially.

As noted under Borax, at San Fernando the **Paradise Borax Mining Company** manufactures a pigment called Silumnia Kalsomine, which is used in finishing plastered walls.

³⁵R. X, p. 281-2.

³⁶R. IX, p. 208; also, Bull. 38, p. 338.

This material is made from a deposit lying north of San Fernando and about $1\frac{1}{2}$ miles south of Humphrey's Station in the Santa Clara Valley. It is in sections 25 and 27, T. 4 N., R. 15 W., S. B. M. The mineral is a clay containing 9 to 15% boracic acid.

MINERAL WATERS.

While the curative effects of medicinal waters have long been known, there has been of late for some years, a constantly growing demand for bottled waters for table use. In this case, the chief requirement is purity. The sale of such waters is an industry of some consequence and, for Los Angeles County, amounted in 1914, to \$8,025.

There are a number of mineral springs in Los Angeles County, some of them being within the city limits of Los Angeles. Of these the more important are **Bimini Springs**, Third St. and Vermont Ave., Bimini Water Company, owners, J. J. Warrick, manager baths and sanitarium.

Radium Sulphur Springs, 5663 Melrose Ave., near Gower St., and near the old village of Colegrove, G. P. Gehring, manager. Baths and sanitarium.

Rose Spring Mineral Water Company, 4835 Pasadena Ave., R. F. Smith, manager, 214 Van Nuys Bldg. Bottled for sale.

Elysian Spring Water Co., A. D. Pugsley, manager. Well and bottling plant, Valentine St., cor. Baxter. Bottled for sale.

Outside of Los Angeles are the following:

Santa Fe Springs, three miles southwest of Whittier.

Kentucky Springs, four miles south of Vincent Station, on S. P. R. R.

Several springs carrying sulphur have been reported from near **Chatsworth** as follows:

Mouth of Bell Cañon, five miles southwest of Chatsworth.

Santa Susana Mountains, five miles north of Chatsworth.

Santa Susana Mountains, one and a half miles north of Chatsworth.

Others occur on the **Tucker Ranch**, ten miles northwest of Santa Monica. These last records are from the U. S. Geological Water Survey, Water Supply Paper No. 338, by Gerald A. Waring, p. 380. To this valuable publication the reader is referred for further details.

PETROLEUM AND NATURAL GAS.

The subject of these important mineral fuels is in charge of a special division of the State Mining Bureau, and so the writer will not discuss them here. A recent publication, covering the subject is,

"Petroleum Industry of California," Bulletin, No. 69, by Mr. R. P. McLaughlin and Mr. C. A. Waring. Special publications on the several oil fields are Bulletins of the U. S. Geological Survey, Nos. 309, 317, 322, 357, 398 and 406, describing respectively, in much detail, the Los Angeles and Puente Hills fields, the Santa Maria District, the Coalinga District and the McKittrick-Sunset Districts. To these authoritative works, the reader is referred for full particulars.

In 1914 the production of petroleum in Los Angeles County was 3,558,690 bbls.; valued at \$1,957,279.00 and gas production was 1,250,000 cu. ft., valued at \$75,000.00.

POTASH.

While some production of this material is annually reported from Los Angeles County, no mineral deposits are known from which it could be produced.

On the coast near Point Fermin, are, however, very extensive growths of the seaweeds known as kelp, which contain a substantial percentage of potassium chloride and have been discussed in publications of the U. S. Department of Agriculture³⁷ as an important source of this material so valuable for the manufacture of fertilizer. On Long Beach Harbor is an extensive plant for the extraction of potash from kelp. This industry was undertaken some years ago by a corporation called the Coronado Chemical Company, operating at Cardiff, on the coast of San Diego County. About 1912, this was merged in a new corporation known as American Potash (Inc.), which began the construction of a plant on Long Beach Harbor, west of the city of Long Beach. After two reorganizations the title of the company has been changed to the **American Products Company**, which is now perfecting the plant (see Photos No. 9 and No. 10) and preparing to produce potash on a large scale. I. M. Naylor is president and manager. This plant in contradistinction from the usual practice, does not burn the kelp, but uses a wet, digesting method (the "Naylor" process), by which the potassium salts are extracted without destroying the other constituents, particularly the cellulose. This latter is to be used in the manufacture of handles for knives and other instruments. It is intended also to recover the iodine and bromine that may be present in the kelp. The potash is refined and shipped in the form of both the chloride ("muriate") and the sulphate. The kelp residue will be utilized for fertilizer mixtures.

The **Sea Products Co.**, Seventh St., Long Beach, Howard W. Judson, manager, has a plant north of the American Products Co. Their

³⁷Senate Document No. 190, 62d Congress, 2d Session.



Photo No. 9. Potash plant of the American Products Co. at Long Beach.
Photo by Walter W. Bradley.

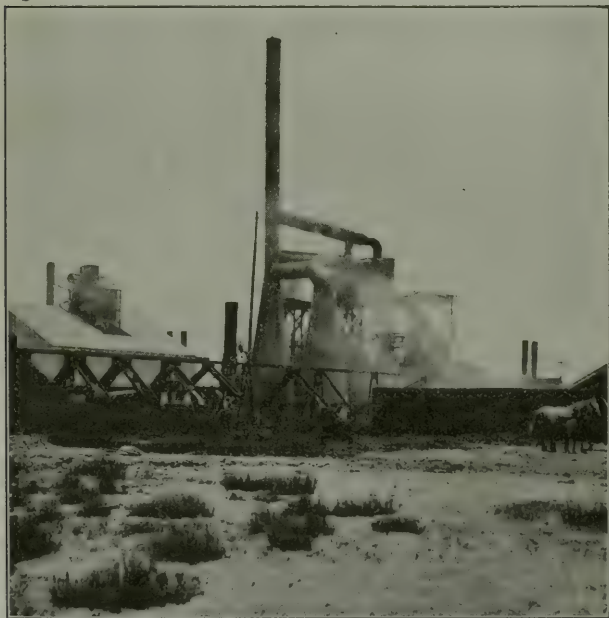


Photo No. 10. Kelp storage and furnaces in the plant of the American Products Co. at Long Beach. Photo by Walter W. Bradley.

practice is to burn the kelp and ship the ash to fertilizer manufacturers.

The **National Kelp Potash Co.**, A. C. Walker, manager, is building a plant near that of the Sea Products Co., and will dry (not burn) the kelp in a rotary kiln. The dried kelp will be shipped to fertilizer manufacturers.

Potash in Kelp.

The extraction of potash salts from kelp has so long attracted attention that it may be of interest to give here a few facts concerning the industry. One of the abundant and prolific species of kelp in this region is known botanically as *Macrocystis pyrifera* and the average of many analyses made in the laboratory of the U. S. Bureau of Soils shows a mean content of potassium chloride amounting to 23% of the dried kelp.

Kelp loses, in drying, 85% of its weight, and in extracting potash the evaporation of this large amount of water constitutes quite a factor in the expense of operation. The relation, however, of cost to selling price is such as would appear to make this industry very profitable under conservative management, especially in view of the present scarcity of German potash salts and the increasing demand for such material.

The **American Trona Corporation**, Alfred von der Ropp, president, with offices at No. 366 Pacific Electric Bldg., Los Angeles, is building a refinery for potash and other saline products at San Pedro. The crude materials will be shipped from their plant at Trona on Searles Lake in San Bernardino County, where only a rough or first concentration is to be made.

SALT.

The chief production of salt for domestic purposes in Los Angeles County, is by the **Long Beach Salt Company**, its production amounting to 10,000 tons per year. This plant, which recovers salt from sea water by solar evaporation is one-half mile south of the Anaheim road west of Long Beach. The holdings amount to 1200 acres of salt marsh which has been divided into shallow ponds for evaporation, by dredging and the construction of low dams.

The process of separating salt from sea water by solar evaporation is quite simple and was described in detail in connection with the Western Salt Company in the report on San Diego County.³⁸ This corporation has offices at 111 W. Third St., Long Beach. Its officers are S. Townsend, president, and C. J. Walker, secretary.

But one other salt manufacturing plant has been operated in this

³⁸Geology and Mineral Resources of San Diego and Imperial Counties, 1914, pp. 83-86.

county. This was within the limits of Redondo Beach and was described as follows:

Lake Salinas, Redondo. In regard to this, Mr. E. B. Preston, writing in 1890, in Report X, p. 281, gave the following description:

"Within the limits of Redondo Beach, is a small salt-water lake, about three hundred yards from the ocean, and about five feet above high-water mark, which does not receive its water supply from the ocean, having an entirely different combination of salts, and possessing features that make it of much interest to the geologist and chemist.

"The lake is about half a mile long, and from four to six feet deep. At the south end is a large shallow basin separated from the main lake by gates. The banks are low and gradually sloping, a sand dune intervenes between the ocean and the lake, and the bottom of the latter is a bed of clay. Around this pond, on both sides, about thirty wells have been bored to an average depth of twelve feet into the clay that forms the bottom of the lake, and all of these yield good, soft drinking water. Between these sweet-water wells next to the ocean, and the ocean itself, near the top of the sand dune, a well has been sunk twenty-six feet, passing through the clay for a distance of ten feet. The water obtained in this well, is claimed to have medicinal qualities; it certainly tastes bad, if that is any criterion of its medicinal value.

"The lake water is a much stronger solution of salts than the water from the open ocean, containing a much larger proportion of magnesium chloride, but the statement to the writer, made by parties on the spot, that the water was ten times as highly saturated as sea water, is evidently erroneous, as such a solution would pass the point of saturation. How to account for the presence of these different qualities of water in their relative positions, is not plainly to be seen. The salt water could be accounted for in several ways as there are saliferous shales and sandstone in the neighborhood; also, there are magnesian rocks on the flanks of the hills surrounding the plain; but the fresh water in the wells surrounding the lake conflicts, from the fact that these wells, terminating in the clay, compel the assumption that the water in them is drainage water from the near vicinity."

Concerning this Salt Lake, Dr. Gilbert E. Bailey, in 1902, wrote in Bulletin No. 24, p. 122:

"Salt works were erected some years ago near Redondo, on a small lagoon about half a mile north of the town. The waters of this lagoon contain a strong brine, but the work of making salt was interrupted first by one misfortune, and then by another. The works were equipped with considerable machinery, that was taken down and removed in the fall of 1901; and the present operations are confined to vat work and solar evaporation on a small scale."

At the present time, this business has been suspended for at least ten years.

SILICA.

(Including glass sand.)

Silica occurs quite abundantly in this county and is worked to a moderate extent. Large quartz veins of high purity are frequent and one outcrop was worked in 1906 near Lancaster, as follows:³⁹

"About four miles southwest of Lancaster, is a deposit from which quartz was formerly obtained for the glass works at Los Angeles. The quartz was hauled by wagon from the quarry to Lancaster, from which it was shipped by rail to the glass works. It was a white, milky quartz, quite free from impurities."

Another large deposit of vein quartz belonging to **Telfair Clayton** of Los Angeles, lies between Lancaster Station on the S. P. R. R. and Muroc Station on the Santa Fe Ry.

Not long ago the **Los Angeles Silica Corporation**, 309 Central Bldg., Los Angeles, was formed to work a deposit of quartz near Tujunga Cañon in the south one-half of the southeast one-fourth of Sec. 34, T. 3 N., R. 14 W.

This is probably a tertiary sediment, but proved to be too impure for a glass sand, though available as a filler in asphalt paving. The deposit has not been developed and the corporation is moribund.

In Bulletin No. 38, p. 277, is the following note made in 1906:

"C. E. Joslin, 900 Braly Bldg., Los Angeles, owns a quartz vein six miles northwest of Acton which has been opened during the present year. The vein is reported to be thirty feet thick. Analyses of two specimens gave, for one, 98.3 per cent of silica and 1.3 per cent of iron and alumina, and for the other 99.43 per cent of silica." At present this deposit is idle.

One-half mile south of Ravenna Station in the north one-half of Sec. 16, T. 4 N., R. 16 W., is a deposit of silica controlled and worked by the **Ohio Valley Construction Company**, John Schrader, manager, Marsh-Strong Bldg., Los Angeles. The holdings consist of eight claims called the Elizabeth group.

A deposit of siliceous sand between Polomas and Santa Feliciana Cañons was noted in 1889 by E. B. Preston.⁴⁰ This would be in T. 5 N., R. 17 W., but it does not appear that it has ever been opened commercially.

Glass.

Glass is a material so widely used in modern life that glass factories seem a logical appendage of every large city. While this industry

³⁹Bull. 33, p. 277-278.

⁴⁰C. S. M. B., R. IX, p. 202.

has been initiated in and near Los Angeles it is lifeless at present, though there is promise of a new plant of large size in this neighborhood.

In Bulletin No. 38, pp. 277-8, is the following record:

"Southwestern Glass Manufacturing Company, G. E. Bettinger, president, 301 North Avenue 19, Los Angeles, successor to the Los Angeles Glass Company, began operations in February, 1904. The company obtains its lime from Colton and its quartz from Lancaster. Bottles, Mason jars and packing jars are manufactured. The Mason jars are made by machine, but the bottles and small jars are blown in molds. The glass is free from iron color, but has a smoky tint that slightly mars its beauty. Located as it is in the midst of one of the greatest fruit districts in the world, this factory should have an extensive local trade in fruit jars and bottles."

This manufacturing enterprise has long been abandoned and its old factory is now occupied by the Pacific Mineral Products Company.

On the salt meadows west of Long Beach is a plant operated a few years ago by the California Glass Insulator Company. For some two years this has been idle.

Since January, 1916, a new plant is being erected under the following title:

The **Torrance Window Glass Company** (formerly Hurrle Window Glass Co.) manufacturers of window glass, Torrance, California. Office at plant, Torrance. C. L. Bisbee, secretary and treasurer, of the firm of Bisbee, Fishburn Company, Twentieth and Alameda Sts., Los Angeles.

The Torrance Window Glass Company is completing its plant of six buildings, which constitutes the first of four units, and will cost \$40,000. The site covers a ground area of five acres. The first unit will employ 116 skilled workmen (blowers and cutters) and will operate day and night. The initial capacity of the plant will be 10,000 to 12,000 boxes of glass per month, each box containing 50 square feet of glass.

The company, while it has sufficient raw material to use, is in the market for soda ash, salt cake and pure silica sand in quantity, f. o. b. shipping point, provided these materials can be secured within a reasonable distance of their plant. At the present time, it is securing its silica from Monterey, California. The company is a close corporation, and other directors aside from those mentioned above are Julius Conrad, Arthur Asher, and Adolph Siorty.

ORANGE COUNTY.

INTRODUCTION.

In shape this county is nearly a rectangle, with the longer axis northwest and southeast. It is bounded on the east by Riverside County, north by San Bernardino and Los Angeles counties, west by the latter county and south by the Pacific Ocean. It contains 795 square miles, and was included in Los Angeles County when the latter was organized in February, 1850, but in March, 1889, Orange was separated into a distinct county. It has a shore line of about 40 miles.

About three-fifths of the area of this county is valley land and the remaining two-fifths is mountain and foothill land. The Santa Ana range of mountains is the line between Orange and San Bernardino counties at the northeast corner of the former county. It is also the dividing line between Orange and Riverside counties on the east. This range also sends up a line of foothills westwardly along the seashore nearly half way across the county. The highest point is locally known as Saddleback, or Santa Ana Peak. In an early day this was known as Santiago Peak, but in 1861 it was ascended by Prof. J. D. Whitney, then State Geologist, who named it Mt. Downey, in honor of J. G. Downey, Governor of California. He found the elevation to be 5,675 ft. above the sea level. All of the western portion of the county is included in the Santa Ana plain or valley. There are also several small valleys among the foothills and along the mountain streams. The Santa Ana plain is covered with a rich loam, and, with the exception of some patches of alkali, is very productive.

GEOLOGY.

The geology of Orange County was reported on by Dr. Stephen Bowers in the Xth Report of the State Mineralogist, pages 399 to 409, and later by Mr. Harold W. Fairbanks in the XIth Report of the State Mineralogist, pages 76 to 120. From each of these reports some descriptions have been abstracted by the present writer, and to them both the reader is referred for fuller details.

The results of an important study of eastern Orange County, which reviews the structural geology and describes the geologic horizon of the coal beds and some of the associated clay deposits are given in a paper entitled "The Martinez and Tejon Eocene and Associated Formations of the Santa Ana Mountains," by Roy E. Dickerson, University of California, Bulletin of the Department of Geology, Vol. VIII, No. 11, pp. 257-274-a.

MINERAL RESOURCES.

Orange County stood second in the list of mineral producing counties of California for the year 1914; due mainly to petroleum. Other items yielding in commercial quantities are: clay products, natural gas, and miscellaneous stone.

Orange County is well supplied with valuable minerals. There once were some apparently extensive silver deposits in the Santa Ana Range, and both gold and silver in some other portions. What were known as the Pellegrin or Alma "diggings" were on one of the branches of Santiago Creek; the veins cropped out on the side of the mountain; the upper portion composed of surface pockets and chimneys, with indications of fissure veins below. The elevation here is about 2300 ft. Several tunnels were excavated and much ore extracted. In 1894 the ore, after having been taken out, was sacked and carried on horseback $3\frac{1}{2}$ miles, where it was loaded into wagons and hauled 18 miles to McPherson, from which place it was shipped to San Francisco. After paying all expenses, it was said to have netted over \$41.00 per ton. Within 300 ft. of the tunnel referred to, was a stream of water.

On the opposite side of Santiago Cañon, is an elevation called "Carbonate Hill," which seemed to contain much valuable mineral. It is approached from the southwest along Weakly Cañon, and has an elevation of 2600 ft. above sea level. The most valuable mineral of this "hill" is lead carbonate. W. S. Morrow, who has taken up several claims, has made openings which expose the ledge for some 3000 ft., and it is said to run high in silver.

METALS.

GOLD.

As stated by Dr. Bowers, gold was found at a number of points in the Santa Ana Range. At present it seems to be mined at only one point. This is in Lucas Cañon, to the northeast of San Juan Capistrano. This is a placer deposit, of limited size, which has yielded some coarse gold. Actually, it lies in Riverside County, and so its discussion does not properly belong with Orange.

QUICKSILVER.

R. XI, p. 118.

"The ore of mercury formerly discovered is found about 2 miles east of Tustin, in an outlying hill of Tertiary sandstone, partly surrounded by the Santa Ana Plain, as described by Mr. H. W. Fairbanks. The hill rises 100 feet and is about 1000 feet long and perhaps half that in width. It is several miles south of the lava deposit near

ORANGE COUNTY—Table of Mineral Production.

Year	Petroleum		Natural gas, value		Brick		Clay		Stone industry, value	Miscellaneous minerals	
	Barrels	Value			M	Value	Tons	Value		Amount and kind	Value
1889	-----	-----	-----	-----	-----	-----	-----	-----	-----	Gold	\$8,262
1890	-----	-----	-----	-----	-----	-----	-----	-----	-----	Gold	10,943
1892	-----	-----	-----	-----	-----	-----	-----	-----	-----	Gold	9,470
1894	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,500 tons coal	6,000
1895	-----	-----	-----	-----	-----	-----	-----	-----	-----	{ 900 tons coal	4,000
1897	-----	-----	-----	-----	-----	-----	-----	-----	-----	{ Gold	144
1898	12,000	\$12,000	-----	-----	-----	-----	-----	-----	-----	800 tons coal	3,200
1898	60,000	60,000	-----	-----	300	\$2,400	-----	-----	-----	600 tons coal	2,400
1899	108,077	108,077	-----	-----	200	1,600	-----	-----	-----	{ 25 tons gypsum	250
1900	254,397	254,397	-----	-----	-----	-----	-----	-----	-----	240 cubic feet sandstone	120
1901	302,652	181,591	-----	-----	-----	-----	-----	-----	-----	{ Gold	2,407
1902	1,103,793	824,492	-----	-----	-----	-----	-----	-----	-----	500 tons coal	2,250
1903	1,355,104	1,016,285	-----	-----	1,034	13,000	-----	-----	-----	{ 300 tons coal	1,500
1904	1,470,000	1,144,542	-----	-----	1,500	9,000	-----	-----	-----	{ Gold	4,000
1905	1,510,900	711,632	-----	-----	118	11,800	10,500	\$14,581	-----	Gold	150
1906	2,388,000	1,194,000	-----	-----	1,365	13,500	7,740	12,900	-----	408 cubic feet sandstone	200
1907	2,426,750	1,456,050	-----	-----	3,176	26,000	-----	-----	-----	500 cubic feet sandstone	250
1908	3,376,689	2,532,517	-----	-----	4,050	30,450	9,000	18,600	-----	{ 964 pounds copper	193
1909	4,270,967	2,690,709	-----	-----	4,060	20,650	2,617	26,170	\$3,005	{ 24,472 pounds lead	1,303
1910	5,044,001	3,177,721	-----	-----	2,850	31,000	500	5,000	23,665	{ 33,546 pounds zinc	2,000
1911	6,345,275	4,097,980	-----	-----	1,650	11,550	2,000	3,200	6,443	Unapportioned, 1900-1909	534
1912	6,704,421	4,478,553	\$5,250	-----	1,300	9,100	2,100	3,400	855	450 tons glass sand	688
1913	9,485,362	6,867,402	9,612	-----	2,100	14,000	15,500	20,666	21,248	-----	-----
1914	12,756,678	8,612,108	112,040	-----	1,333	19,300	-----	-----	36,515	364 pounds lead	17
1915	12,715,457	6,510,314	81,738	-----	1,280	16,000	-----	-----	88,315	{ 4 pounds copper	1
Totals	71,692,523	\$45,930,371	\$208,655	-----	27,046	\$219,350	49,957	\$104,517	\$189,373	-----	\$131,118

the entrance to Santiago Cañon. The sandstone dips north at a small angle, and consists of a loose aggregate of quartz grains cemented by a kaolinitic material. The whole hill has been affected by mineralizing agencies, and can be distinguished a long distance by its red color. Deep red tints and a bright yellow can be seen everywhere. No hardening or metamorphism of the sandstone has taken place. On the north side of the hill are one or more veins of baryta, or heavy spar, running in an east and west direction, and dipping south. They are usually not over a few inches wide. These carry in places the steel-colored metallic mercury, which on its surface presents a reddish tinge. This mineral is distributed in small masses, usually somewhat veinlike, in the baryta. It is not present in any great quantity. In places the ore appears in minute stringers in the somewhat indurated aluminous sandstones adjoining. A tunnel several hundred feet long was run into the hill from the south, but it encountered nothing but bright red and yellow sandstones. Another short one on the north met only some little veins of baryta. A short incline had been run down on the veins. Appearances did not indicate that the mineral was present in any quantity. Specimens were placed in the hands of Professor Dana, but no published analyses have yet been made, so nothing definite can be said about its composition. The deposit must be in some way related to a volcanic action a little distance north." It has never been opened for commercial purposes.

SILVER.

The old silver mines of Orange County are described by Mr. H. W. Fairbanks, R. XI, pp. 108-120. To this report the reader is referred for a record of these old mines in 1892. In Dr. Bowers' article, Xth Report, some earlier details will be found.

TIN.

From time to time in Orange County rumors of tin mining have been heard and at a point in the Santa Ana Range considerable money has been spent in development work and the equipment of a mill. The parties interested in this operation were Mr. Gail Borden of New York and Mr. L. C. Comer of Los Angeles. It does not appear that the enterprise was in any way successful, and, while assessment work has been done on a large number of claims and an application was made at the Land Office to patent some of these, the undertaking has not yet progressed any further.

NONMETALS.**CLAY.**

On the west side of the Santa Ana range are deposits of clay which will probably be found to equal in geologic age and commercial properties those of the Temescal Valley. A deposit which has been opened and which is now regarded of commercial importance is one owned by the **Los Angeles Pressed Brick Co.** It is an important deposit of fire clay of high quality, lying a few miles south of the Santa Ana River. The material was formerly shipped to Los Angeles, by hauling it to Gypsum station on the Santa Fe railroad. This necessitated crossing the bed of the river which was only fordable for about 60 days in the year, and this period is entirely too brief to permit of a satisfactory stock of raw material to be stored at the factory for a year's work. Consequently this important deposit lies in abeyance awaiting the development of railroad transportation across the Santa Ana River.

La Bolsa Tile Company is manufacturing drain tile at its plant at Smeltzer, Orange County. A. N. Griffith, Huntington Beach, is secretary.

J. Wm. Sackman has a brick plant and kilns at Santa Ana, where he manufactures common red brick for local consumption.

COAL.

In the reports of Mr. Fairbanks and Dr. Bowers reference is made to several deposits of coal. But one of these is now receiving any attention and that is the old Santiago coal mine, which is operated by the **Orange County Coal Mining Co.**, a corporation, with offices in H. W. Hellman Bldg, Los Angeles, A. J. Padgham, Santa Ana, president. The production is small, although the coal has been used for domestic and other purposes.

GYPSUM.

United States Geological Survey Bulletin No. 223, pp. 120-121.

"Gypsum Cañon. A deposit lies in a small cañon, known as Gypsum Cañon, on the west slope of the Santa Ana Range, in Orange County. It is in the form of a bunchy vein in rocks of probably Upper Cretaceous age. The strata are chiefly sandstone. The deposit has a thickness of 8' to 10'. The gypsum is white and crystalline and is almost as clear as alabaster. At one spot a mass of dolomite was found inclosed in it."

LIMESTONE.

The following is a synopsis of the limestone prospects in this county, which have been tested experimentally for their value in making lime and cement.

Capistrano. Sec. 31, T. 7 S., R. 7 W., S. B. M., R. Egan, Capistrano, owner. A deposit of fossiliferous limestone, used by the padres to burn lime for the mission buildings.

El Toro. A similar limestone was burned about 1888, but the kiln was abandoned after a campaign not lasting two years. Extensive beds of this fossiliferous limestone are found on **Moulton's Ranch**, south of El Toro. The following analysis of this limestone is reported: carbonate of lime, 96%; silica, 2.5%; alumina, 1%; iron oxide, 0.5%.

Some years ago tests in the manufacture of cement were made by using clay and the fossiliferous limestone found on the ranch of William L. Moulton, near El Toro. The product was of satisfactory quality, but the high cost of fuel at that time prevented the manufacture from a commercial standpoint. With the present supply of oil as fuel, cement could probably be produced commercially from the limestone and clay found on this property.

PETROLEUM AND NATURAL GAS.

Orange County, as has already been stated, by reason of its yield of petroleum, stood second among the active mineral counties of California for the year 1914. The production amounted to 12,758,678 bbls., valued at \$8,612,108. In addition to this, natural gas was reported to the amount of \$112,040 in value. Natural gas accompanies to a greater or less extent, the petroleum in all of the oil fields of the state.

Petroleum has but recently been the subject of an exhaustive investigation by Messrs. R. P. McLaughlin and C. A. Waring, of the State Mining Bureau, and the results published as Bulletin 69. To this and the other published reports noted below, the reader is referred for full information.

The Orange County oil fields are also thoroughly discussed in Bulletin 309 of the U. S. Geological Survey, 1907, by G. H. Eldridge and Ralph Arnold.

References: Bull. 19, pp. 57-61, 79-82, 177, 180; Bull. 32, p. 20; Bull. 63, p. 334; Bull. 69, pp. 118, 308, 350, 366, 503.

STONE INDUSTRY.

Crushed rock, sand and gravel were reported by the county assessor as produced in considerable quantities in Orange County during 1914. The materials were used for concrete and road work.

The **Southern Pacific Railroad Company** from pits adjoining its right of way obtains sand and gravel for ballast and construction purposes.

OTHER NONMETALLIC MINERALS.

Several other materials of economic value have been found in Orange County, but they have not been developed or worked commercially so it seems inexpedient to give space to their discussion.

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RIVERSIDE COUNTY.

INTRODUCTION.

The following report on the mineral resources of Riverside County is based on field work performed during the summer and early autumn of 1914.

The examinations of the mineral deposits in the desert section of eastern Riverside County, had, on account of the climate, been deferred until autumn, and it was at the inception of this work that, on November 11th, while at Mecca, the writer was stricken by an illness which terminated his field work for the season. Through the courtesy of the State Mineralogist, a well trained and efficient geologist, Mr. Clarence A. Waring, was detailed to complete the unfinished work in eastern Riverside County, and from his observations and written descriptions the new material relating to this area has been derived.

HISTORY.

Riverside County, organized by act of the state legislature on March 11, 1893, from portions of San Diego and San Bernardino counties, has an area of 7,240 sq. mi., and a great variety of agricultural and mineral resources. Further, from the diversity of its surface, it affords marked variations in climatic conditions, and, in many areas, offers to the tourist and health seeker, unsurpassed attractions in the several seasons of the year.

TOPOGRAPHY.

The surface of Riverside County, like that of much of southeastern California, is characterized by bare mountain ranges, separated by nearly level arid belts of varying width. The minor ranges of mountains rise abruptly from the desert plains, having the appearance of being the summits of larger ranges whose bases are buried beneath the loose deposits of the desert. The principal range of Riverside County is that known as the San Bernardino Mountains, the principal summits of which are San Bernardino and San Gorgonio, measuring respectively 10,630 and 11,485 ft. in altitude. This range is flanked on the southwest by the broad valley and plain of western San Bernardino County which terminates to the southeast in the narrow valley known as the San Gorgonio Pass, the summit level of which at Beaumont, measures 2570 ft. South of San Gorgonio Pass is the lofty range of southeast trend known as San Jacinto, with its lofty peaks, San Jacinto and Tahquitz, measuring respectively 10,805 and 8825 ft. in altitude. To the eastward the slopes of the San Jacinto Range decline rapidly toward

the plain known as the Coachella Valley and desert, Coachella being the corruption of the old Spanish name Conchilla. To the southeast, the Coachella Valley terminates in the Salton Sink, which has been carefully mapped by the U. S. Geological Survey and has been discussed in our report on Imperial County.

Central Riverside County is marked by several small desert plains. One of these, south of Riverside and west of Perris, is a striking topographic feature. This and others are clearly shown on the U. S. G. S. topographic map known as Southern California Sheet No. 1, to which the reader is referred for further detail.

GEOLOGY.

The geology of Riverside County has not yet been studied in detail. The first careful reconnaissance made through this region was in the latter part of the year 1853, when Professor William P. Blake, as geologist of the expedition under Lieutenant R. S. Williamson to determine a route for a transcontinental railroad, traversed the San



Santa Rosa volcanic plateau from Murrietta Hot Springs, Riverside County.

Gorgonio Pass together with the Coachella Valley and the Salton Sink. The important results of this work are published in Vol. V, of the reports of the expedition, issued as Senate Document 78, of the 33d Congress, 2d Session. But little geologic detail of interest escaped the notice of this keen observer. In 1892, Mr. Harold W. Fairbanks, under the auspices of the State Mining Bureau, made a careful geologic reconnaissance of San Diego and Orange counties, the former of which then included most of Riverside County. His results are published in the XIth Report of the State Mineralogist, pp. 76-120. To this report the

reader is referred for much interesting detail. See also "Guide Book of the Western United States," Part C, the Santa Fe Route, U. S. Geological Survey, Bull. 613.

MINERAL RESOURCES.

The mineral resources of Riverside County are varied and of material importance, having amounted in 1914 to \$1,579,586.¹ But it has never been a large producer of metals, and, as the figures show, its chief mineral wealth lies in nonmetallic products. The details of the deposits from which these are mined are given in the following pages.

METALS.

The metals which have been produced in this county in sufficient quantity to be recorded in its statistics are gold and silver. Iron is known to exist in very large deposits, which could be mined successfully if industrial conditions were more favorable. Copper, manganese, and tin are also known to occur in limited quantities.

ANTIMONY.

Crowell Mine. C. S. M. B., R. XIII, p. 31. Five miles southwest of Corona, at 1700 ft. elevation. The ore, stibnite, occurs in irregular bunches in a mass of much shattered and decayed rock. A number of superficial cuts have been made at various places on the claim, and from one of them several hundred pounds of stibnite have been taken out. The workings had caved, and a satisfactory examination was impossible. The ore found was of excellent quality. J. Irving Crowell, of Corona, owner.

COPPER.

This metal is rather widely distributed in Riverside County, and the principal deposits, which lie well eastward towards the Colorado River, were briefly described in Bulletin No. 50, from which some of the following descriptions have been taken.

Thus far, there has been only a nominal production of copper, the total for 1914 aggregating but \$4802.

Badger State Group. See Bull. 50, p. 337. Ten claims in the east slope of the Ironwood Mountains. Granite is the country rock. There are a vast number of stringers from 6" to 4' wide, the walls being of porphyry and limestone. The ore contains copper, gold and silver. There is much iron in these claims. About 300 feet of development work has been done in open cuts, shallow shafts, etc., which reveal

¹See C. S. M. B., Bull. No. 70, pp. 98-99.

RIVERSIDE COUNTY—Table of Mineral Production.

Year	Gold, value	Silver, value	Other metals		Coal		Salt		Magnesite		Brick		Clay		Lime and limestone		Stone industry ¹ value	Mineral water		Miscellaneous and unapportioned	
			Pounds	Value	Tons	Value	Tons	Value	Tons	Value	M	Value	Tons	Value	Barrels	Value		Gallons	Value	Kind	Value
1900			125,280 tin	\$27,564																	
1901			125,000 tin	32,400																	
1902	\$45,412																				
1903	95,722																				
1904	285,100	\$2,550			7,991	\$16,142	1,961	\$3,902					3,700	\$4,233	24,000	\$15,000	\$24,000			90 tons gypsum.....	\$100
1905					7,950	15,000	4,000	8,000					7,700	9,400	110,000	10,000	27,915			18 tons gypsum.....	144
1906	292,800	13,450			4,982	9,964	4,317	8,634					22,019	22,750	20,000	6,000	17,000				
1907	147,227	4,000			0,582	15,705	4,840	9,680					11,700	11,250	16,000	15,000				6 tons mineral paint.....	150
1908	187,188	1,384			5,500	15,000	5,000	10,000					9,500	10,450	8,000	7,000	8,000			10 tons asbestos.....	250
1909	163,010	2,000			7,905	19,762	3,800	7,200					11,900	16,500	13,478	13,478	8,850			30 tons asbestos.....	750
1910	140,292	6,818			8,000	15,000	4,000	8,000					1,967	28,842	24,500	18,089	57,600			1,000 tons glass sand.....	1,500
1911																				50 tons asbestos.....	1,250
1912	109,747	4,150			2,800	7,000	4,000	12,000					3,201	80,787	30,489	16,024	15,000	15,000		200 tons glass sand.....	3,000
1913																				100 tons asbestos.....	4,000
1914	47,947	94			1,200	3,000	20,000	20,000					4,153	114,165	34,220	38,920	20,000	17,000		500 tons glass sand.....	500
1915	13,453	156											3,817	164,960	53,967	68,722	19,000	8,500		12,000 cubic feet marble.....	1,500
1916	7,188	80											4,712	71,389	41,966	49,222	25,000	21,500		5,000 cubic feet marble.....	2,500
1917	35,690	316											2,538	69,195	49,720	67,070	20,000	20,000		20 tons blanch.....	2,000
1918	4,432	251											4,007	92,140	60,123	57,712	14,000	20,000		2,500 cubic feet marble.....	2,500
1919	3,836	26	3,200 lead 502 copper	170 100					75	\$1,750			3,800	102,000	87,290	174,718	6,000	6,000		2,000 cubic feet marble.....	2,000
1920	5,884	112	22,065 copper	2,816					2,000	4,000			4,803	74,681	71,231	89,702	18,000	8,000		Gems.....	50
1921	186	24	8,000 copper	1,016					324	3,888			22,007	265,550	58,028	97,971	3,000	3,000		10 tons asbestos.....	100
1922	5,885	28							500	4,000			10,267	91,743	101,411	156,844	111,722	120,880		2 tons asbestos.....	500
1923																				90 tons gypsum.....	2,000
1924	\$20,023	2,121	6,753 copper	814					375	4,000			3,675	28,572	67,295	79,061	474,018	20,000	20,000	150 tons mineral paint.....	1,500
1925	20,202	254	929 lead 8,000 copper	42 900					878	8,780			2,500	20,000	72,040	93,418	190,531	63,582		Gems.....	250
1926																				Unapportioned, 1900-1909.....	877,192
1927	12,501	104	8,071 copper	1,391					569	4,552			3,530	30,100	88,950	89,963	538,844	20,000	20,000	800 tons glass sand.....	800
1928																				Gems.....	500
1929	10,000	100	38,102 copper	4,802									1,610	30,718	70,136	69,420	296,892	100,000	20,000	Other minerals, 1910-1912.....	1,512,857
1930	10,769	1,622	32,072 lead 23,825 copper	1,507 4,169									1,075	16,580	59,214	54,840	213,440	20,000	10,000	1,000 tons gypsum.....	1,000
Totals	\$1,640,700	\$37,280		\$77,811	61,210	\$110,573	76,738	\$122,476	4,921	\$31,570	83,882	\$1,310,473	1,008,411	\$1,705,641		\$125,697	\$4,645,208	754,830	\$50,750	Other minerals.....	1,242,794

¹ Includes granite, crushed rock, gravel, sand, paving blocks.² Includes part of Los Angeles County.³ Includes cement, potash, silica.⁴ Includes limestone.

TOTALS.

Gold.....	\$1,640,700
Silver.....	37,280
Other minerals.....	17,811
Coal.....	110,573
Salt.....	122,476
Magnesite.....	31,570
Brick.....	139,473
Clay.....	1,205,641
Lime and limestone.....	453,697
Stone industry.....	4,645,208
Mineral water.....	59,750
Miscellaneous and unapportioned.....	8,117,810

Grand total.....\$17,911,469

good ore. Owned formerly by S. P. Cressinger, Los Angeles, but now in the Crescent Group.

Randolph & Hamilton Claims. These consist of 2 groups and 7 claims in Santa Maria Mountains. The deposits consist of copper and chromic iron, and some gold, at an elevation of about 1750 feet. A shaft 21 feet deep has been sunk and 4 or 5 cuts made. The copper value is 7% to 8%. Iron largely predominates. There is much limestone as country rock, and some porphyry. Former owners, Randolph & Hamilton, Ehrenberg, Arizona. The claims are now held by Floyd Brown, Blythe City.

Anderson Claims. There are 26 claims in this group, located in the northern part of the county. The strike is northwest. The ore carries copper with a little silver and the veins vary from 2' to 6' in width. The hanging wall is granite. A shaft 80 feet deep has been sunk and a tunnel 100 feet long driven, with considerable other development work in shafts, etc. Six men were employed. Anderson & Co., owners. These claims are probably in the Monte Negro District. They lie in T. 2 S., R. 12 E.

IRONWOOD OR MCCOY MOUNTAIN DISTRICT.

This district contains a mineralized zone of copper, silver, gold, and lead ores. High grade sulphide deposits exist, principally in the form of kidneys. Besides these, native copper is occasionally met with. The district is 22 miles from the Colorado River and about 20 miles southwest of Blythe Junction on the A., T. & S. F. Ry.

Crescent Group. Ironwood or McCoy Mountains, 17 miles from Blythe, Secs. 19, 20, 29, 30, T. 4 S., R. 20 E. Forty claims, 3000 feet of tunnels and drifts. A total of \$35,000 expenditure, \$6,000 spent last year. Owner, Harwood Robbins, Riverside. Mr. Robbins has incorporated under the name of the Ironwood Mountain Mining Co., but the corporation at present holds no claims.

Mountain King Group. See Bull. 50, p. 342. Three claims on the east side of Ironwood Mountains. The country rock is porphyry and quartzite. The ledge is said to be 30 feet wide. The strike is northwest and southeast, and the dip northeast. The ore, which is azurite and malachite, contains besides the copper, both gold and silver. A shaft 40 feet deep has been sunk, and four open cuts have been made, all revealing good ore. Elevation 1800 feet. Owners, formerly, Adams & Cressinger, Los Angeles; now in the Crescent Group of Harwood Robbins.

PALEN MOUNTAINS.

Orphan Boy Claims. See Bull. 50, p. 341. On the west side of the mountains, 2 miles south of Packard's well. Abandoned.

Fluor Spar Group. Bull. 50, p. 343. Three claims on the west slope of the Palen Mountains, one mile southwest of Packard's well. The country rock is largely porphyry and limestone. The ledge is said to be about 100 feet wide, and strikes northeast and southwest. The ore carries copper, gold, and silver. The copper occurs in azurite, malachite, and some cuprite. There are two open cuts 20 feet or more in depth. Elevation 1800 feet. The claims contain fluor spar, Iceland spar, and limpid quartz. Owner, Andrew F. Burleigh, New York.

Palen Copper Mines. C. S. M. B. Bull. 50, p. 341. Copper, Silver Glance, and Ophir claims. West side of Palen Mountains, 10 miles east of Palen well. Former owner, H. A. Adams, Los Angeles. Now abandoned.

Homestake Group. See Bull. 50, p. 341. There are 5 claims in this group, on the east slope of Palen Mountains, 8 miles northwest of McCoy Springs, at an elevation of 1600' to 2350', and 3 or 4 miles from the Orphan Boy and Ophir mines on the west side of the mountains. The claims are all on the same ledge, which is said to be 20' to 50' wide, and carries copper and silver glance, azurite, and malachite. The development work consists of two shallow shafts and three open cuts. Owner, Harwood Robbins, Riverside. Relocated, 1914.

Crescent Copper Group. Mr. C. A. Waring reports as follows: This group consists of five claims located in the north end of the McCoy Mountains in Sees. 29 and 30, T. 4 S., R. 20 E., S. B. M. About 50 claims were originally located but most of these have been abandoned. They are owned by Mr. Harwood Robbins, of Riverside. The claims are about 12 miles west of the main stage road from Blythe Junction to Blythe. Water has been obtained from the McCoy tanks which were supplied from Chandler's well. This well was dry when visited in November, 1914.

The copper is said to be present in the form of cuprite and chalcocite. The lode, varying in width from 4' to 8', pinches out in places. The country rock is schist. Considerable work has been done on the property, it being claimed that 3000 ft. of tunnels and drifts have been driven. It is said that in no place has work been carried to a greater depth than 160 ft. The assessment work is done by the two Goldburg Bros. of Blythe City. Although it is said that some of the ore ran as high as 35% copper, the average is rather low. Some coarse gold running as high as \$8.00 to \$10.00 per ton is said to accompany the copper values. The McClure claims in the Little Maria Mountains to the north are reported as showing a good grade of copper ore.

Other Prospects. Numerous low grade copper deposits are reported in the Big Maria Mountains, east of the United States Gypsum claims. Only prospecting and assessment work has so far been done in the region.

About $1\frac{1}{2}$ miles south of the Crescent Group is the **St. John Mine**, owned by R. L. Kennedy, of Los Angeles. A 75 ft. incline shaft has been sunk. Some of the ore is said to have smelted 41% copper.

GOLD.

This precious metal is sparsely and widely distributed in Riverside County and many gold mining districts have been recorded, few of them, however, with any large production.

While the geologic occurrence of gold varies greatly in this county, the geographic distribution may be discussed under two principal heads.

I. The region near Perris and Elsinore.

II. The eastern desert area between the San Bernardino Range and the Colorado River.

PERRIS GOLD MINES.

Gold has been sought for and mined in this section of Riverside County since an early date, and there is evidence that Americans operated here in the early years of California's statehood.

Miners who worked here 40 years ago say that, at that time, in Cottonwood Cañon, was an old arrastra bottom in which was growing an elder tree 12 inches in diameter. On Redtop Mountain, in T. 6 S., R. 3 W., was found a location notice dated 1857.

In 1876 there was some excitement at Binkley's diggings in Sec. 2, T. 6 S., R. 4 W., near the junction of Cottonwood Cañon with that of the San Jacinto River. There was also activity at Tyler's diggings in Sec. 10. About 1880, Mexicans were working gold placers between the Good Hope Mine and the San Jacinto River.

W. H. Storms, who visited this region in 1894, writes as follows: "An ancient river-bed may be traced for a long distance north and south in this vicinity. The source of this old channel, which bears gold, is to the north, but its exact locality is unknown. The main channel may, without difficulty, be followed from 2 miles north of the Good Hope Mine for several miles southward toward Elsinore."

Much work has been done at intervals in this area, but the production has not borne out the original promise.

In the more systematic operations on quartz veins which followed, the Good Hope was the chief producer with a record of some \$2,000,000. The Gavilan mines also achieved substantial production.

*C. S. M. B., R. XII, p. 220.

THE GAVILAN MINES.²

About 6 miles west of Perris, on the old Rancho El Sobrante de San Jacinto, owned by an English syndicate, is a plain some miles in area known as the Gavilan.

The country rock is diorite and is cut in many directions by intrusive dikes of pegmatite which contain little muscovite, but black tourmaline is abundant in them, and frequently was accompanied by the gold-bearing rock. Here, were many veins of moderate size, but of good grade, and, on these veins were the Gavilan mines which, years ago,



Gavilan Flat, looking north from Jumbo mine. Tailings dump of Gavilan mine to left in background.

produced considerable gold, the rock being crushed in numerous arrastras, of which the beds, to the number of 50 or more, were scattered about the neighborhood. It is said that the Mexicans, at one point, worked a large shoot down to water level, and judging from the old dumps, the old workings must have been of great extent. In later years, under American management, the ore was hauled to a stamp mill in the Pinacate District. At the time the ranch became the property of the San Jacinto Estate, Ltd., of London, nothing had been done here for many years. Between 1890 and 1892, the old workings were carefully examined and a company was organized at Riverside to operate some of them under lease. A new shaft was sunk 180 feet, and a substantial production was achieved. No work has been done here for some time, the old mill having been sold and taken to Mexico. The local representatives of this British syndicate have offices at Arlington.

²C. S. M. B., R. XI, pp. 336-337; XIII, p. 311.

PINACATE DISTRICT.

About 4 to 6 miles northeast from Elsinore, and about 5 to 8 miles west and southwest from Perris, on the A., T. & S. F. Ry., are the mines of the Pinacate District, named from a small settlement which, before the railroad was built, stood a little south of the site of Perris.

This is largely an area of granitic rocks, succeeded by diorites in the vicinity of the Good Hope Mine. Northeast and east of Elsinore are metamorphic rocks determined on an irregular east and west line by bodies of granite which inclose portions of the schists, and extend into the main body in long, dike-like spurs. In the vicinity of the Good Hope Mine, the metamorphic rocks inclosed in the diorite have a north and south strike, and are traceable for a mile or more.

There are numerous small springs in the district, but timber is very scarce.

In early years this district produced a large amount of gold, the quartz having been worked in arrastras, of which over a hundred beds were formerly visible.

Between 1876 and 1882 much active mining was done here and a substantial production was achieved.

At present, with the exception of the Lucky Strike, all mines are idle and inaccessible. Therefore, little can be predicted about the future of this district. Many of the owners have full faith in their properties and expect to resume work when financial conditions improve.

Santa Rosa: See R. VIII, p. 526; XI, p. 385; XII, p. 225; XIII, p. 314. In the northwest quarter of Sec. 31, T. 4 S., R. 4 W., is the old Mina Rosalia, later called the Santa Rosa, which was opened along the surface by cuts and shafts for over 1000 ft. The upper portion of the vein is said to have been worked out many years prior to 1892, when new capital was interested and a new shaft was sunk at the north end of the property. The vein was about three feet wide and the country rock on either side of the vein was soft and decomposed, requiring much timber. The mine has produced a large amount of gold, extracted at first in arrastras, and later in a 20-stamp mill, which still stands at the mine, but in poor condition. It was understood that, at the north end, the shoot of pay rock was still intact, and it was to recover this that new work was inaugurated in 1892. The balance of the shoot to the south was said to have been worked out down to the water level, at a depth of about 200 ft. At present there is water in the mine and the workings can not be examined. Owners, Hook Bros., Perris.

Golden Chariot: See R. XIII, p. 311. South extension of Santa Rosa. Elevation, 2360 ft. Shaft, 310 ft. One level near bottom. Vein strike N. 10° W., dip 55° SW. Owners, C. L. French and J. M. Day, Redlands.



Santa Rosa Mine, looking west.



Santa Fe Mine, looking southwest from the Santa Rosa.

Jumbo: See R. XIII, p. 312. Here a 2200-foot vein, parallel to that of Santa Rosa, and 300 ft. east, strikes N. 10° W., and dips 80° SW. The workings consist of one 50-ft. shaft. Owner, E. A. Bethurum, Redlands.

Santa Fe: See R. XII, p. 224; XIII, p. 314. One-third of a mile southwest from the Santa Rosa, is the old Santa Fe Mine, which in days past was a producer of gold, but its workings have long been abandoned. The strike of the vein was nearly east and west. A cross-cut tunnel was driven 700 feet into the hill to cut the vein, and appar-

ently intersected the latter at about 500 feet. The 5-stamp mill, formerly in use, has been removed. Owners, R. Woods & Son, Auburndale.

Perris: See R. XIII, p. 313. Elevation 2200 feet. Sec. 31, T. 4 S., R. 4 W. Vein strikes W., dips 80° S., shaft 60 feet, 25-foot drift runs east from bottom of shaft. It is a heavy fissure in granite, accompanied by a dike, but carries little quartz. Owner, W. F. Dray, Forestville, Placer County.

Little Pete: See R. XIII, p. 312. Elevation 2000 feet. Near the Perris claim. Thirty-foot incline on a small east and west vein, containing arsenical pyrites. Owner unknown.

Indian Queen: See Report XIII, p. 311. NW. $\frac{1}{4}$ Sec. 32, T. 4 S., R. 4 W. Vein strikes northwest; dips 70° SW. Shaft, 65 feet. Owner, — Morrison, Goldfield, Nev.



Surface view of Indian Queen and Little Maggie claims.

Little Maggie: See Report XII, p. 223; XIII, p. 312. Adjoining Indian Queen on the southwest. On several small veins in diorite. Strike east; dip 45° S. Quartz high grade. Crosscut tunnel to cut vein at 40 feet. There are many other claims nearby on similar fissures. Formerly owned by — Hasson, of the Los Angeles Times.

Colorado or Justice: See Report XIII, p. 310. In SW. $\frac{1}{4}$ of Sec. 32, T. 4 S., R. 4 W. Vein small; quartz high grade. Owner, J. Boyer, Perris. The mine is on his ranch.

Steele Mine: See Report VIII, p. 527; XI, p. 284; XIII, p. 314. In SE. $\frac{1}{4}$ of Sec. 32, T. 4 S., R. 4 W., is the Victor Mine, formerly "El Plomo," and better known as the Steele Mine. The vein is in metamorphic rocks, the footwall containing much quartz and biotite mica.

The hanging wall is a dark gray diorite, quite fine-grained in texture, containing much hornblende. Small pegmatite dikes cut the formation in all directions. Black tourmalines are numerous in the pegmatite. The vein is described as a foot or more in width, of highly crystalline quartz, in which were disseminated small amounts of iron and lead sulphides and lead carbonate. The ore was quite rich in gold. A tunnel 900 ft. long was driven to develop the vein, on which an incline shaft had been sunk to a depth of 200 ft. Besides this work there are numerous superficial workings, in which quartz of good grade was exposed. No work has been done here for many years. Owner, unknown.

Missing Link: (Virginia-Shay) See Report VIII, p. 526; XI, p. 385; XII, p. 225; XIII, p. 313. Six miles west of Perris, in NE. $\frac{1}{4}$ of Sec. 32, T. 4 S., R. 4 W. Several holes have been sunk on the vein but the workings are flooded and inaccessible. The quartz is said to have carried considerable gold. Owner, Hugh Duff, 626 Wesley Roberts Bldg., Los Angeles.

C. & C. Consolidated: See Report XIII, p. 310. West of the Virginia. Elevation 1800 ft.; 150-ft. tunnel and shaft, and small vein in granite. Owner, unknown.

Stanford: Branching and overlapping fissures in massive eruptive rock. Veins or shoots irregular and best developed at the intersection of fissures or in veinlike masses between fissures. Sometimes the veins are closely parallel in a zone. Then the whole mass may be mined. Shaft, 125 ft. A crosscut tunnel meets the shaft at 70 ft. from surface. Five-stamp mill. There are many prospects near the Stanford. Owner, Mark Herrin, Riverside.

Ophir Mine: Now Lucky Strike. See Report XIII, p. 313. After having lain idle for some years, work has been recently begun on this property. Owners, W. Newport and F. Whiting, Ethanac. See photo, p. 74.

Gold Prince: North Extension of Good Hope. This property is of old record, but is now unknown.

Good Hope Mine: See Report VIII, p. 527; R. IX, p. 151; R. XI, p. 106; R. XII, p. 221 and R. XIII, p. 311. About $4\frac{1}{2}$ miles southwest of Perris in NW. $\frac{1}{4}$ Sec. 15, T. 5 S., R. 4 W.

The veins of this mine strike N. 14° E., and dip 65° W. They are in a dike of light colored biotite gneiss. The mine is in gray diorite. The hanging wall is largely of mica schist. Near the surface are several veins from 3' to 20' apart. These, in depth, appear to unite. The fissure in places contains a heavy clay gouge, the result of continued movement and the crushing of the rock adjacent to the fault plane. The vein quartz shows clearly the effect of this movement by its fractured condition, and the subsequent infiltration of carbonate of

lime into the interstices thus formed. This renders much of the quartz friable, and it usually crumbles on exposure. The vein commonly appears as two separate bands of irregular width.

The fissure was a double one, a vein of quartz forming in each branch. The footwall vein at some points contains very high grade ore, carrying finely disseminated iron sulphide. The quartz was free milling, though ordinarily carrying more or less auriferous iron sulphide of high grade.



Good Hope Mine, looking north.

A 20-stamp mill was built here and operated, but only part of the equipment remains. This mine has not been actively productive for some years, though some work has been done within two years. Owners, Hook Bros., Perris. It is now under lease to the Good Hope Mines Co.; president, E. Groenendyke, 301 Story Bldg., Los Angeles; J. J. Abramson, secretary and manager, 612 San Fernando Bldg., Los Angeles.

Menifee Mine: See R. XI, p. 385; XIII, p. 312. Elev. 1500 feet. This mine is located about 8 miles south of Perris. The vein consists of quartz, gold-bearing in places. The footwall is chloritic schist, beyond which is diorite. The hanging wall is diorite, the hornblende having changed partly to chlorite. The vein is from 1 ft. to 30 in. wide, and strikes northeast, dipping 80° NW. to a depth of 40 ft., where it flattens out to 65° . The quartz is said to have milled about \$15.00 per ton, and contained but a small percentage of sulphides. There are four shafts on the vein; 30', 55', 100', and 125', the main shaft being 5' x 11' with 2 compartments. There is a steam hoist and a 5-stamp mill. Owner, Tom Chaffin, at the mine.

Lucky Boy (Walker) Claim: See Report XI, p. 385; R. XII, p. 223; R. XIII, p. 312. On the Walker Ranch, 2 miles south of Menifee, and 1 mile northeast of the Menifee Mine. In 1892 a new quartz vein was discovered on a low mound at the base of low, rolling hills. The vein was 4" to 1' in width, heavily mineralized, but much broken. Two distinct faults occurred in a length of 90 feet, where the vein was exposed. Two shafts of 50' and 60' were sunk. The rock would pan out about \$40.00 per ton, but too small an amount of work has been accomplished to make any estimate of the value of the vein possible. Owner, S. Walker (dead).



Lucky Strike Mine (formerly Ophir), looking south.

Alice: See Report XII, p. 221; R. XIII, p. 310. Altitude 1500 feet. A 12-ft. incline shaft cutting vein 20 ft. Five-stamp mill. Four miles south of Menifee. Estate of J. M. S. Egan.

Mammoth: See Report XIII, p. 312. Elevation 1600 ft. Nine miles south of Perris in Sec. 8, T. 6 S., R. 3 W. Vein averages 7 ft. in thickness, ranging from 4' to 10'. Strike northeast, dip 15° NW. The croppings are exposed 400 ft. around the side of the hill. Superficial cuts were made at various points. At the end of a 100-ft. cut is a 200-ft. incline on the vein. Crosscut connects with air shaft, 60 ft. to surface. The country rock is grano-diorite. The quartz of the vein is evenly impregnated with pyrite and shows free gold. Owner, A. A. Adair, of Riverside.

Leon: See Report XII, p. 223; R. XIII, p. 312. On Briggs ranch in NW. $\frac{1}{4}$, Sec. 18, T. 6 S., R. 3 W. The ore is in a quartz vein 1' to 2' thick, strike northwest, and dip 85° SW. There is a shaft

150 ft.; also crosseut tunnel 25 ft. toward vein, lower down hill. This is a promising prospect. There is no mill. Owner, Chas. Briggs, Los Angeles, address unknown.

SAN JACINTO MOUNTAIN REGION.

Mr. C. A. Waring reports on this as follows:

The Hemet Belle Mine. The Hemet Belle mine is located at an elevation of 5000 ft. in the San Jacinto Forest Reserve, in Sec. 31, T. 6 S., R. 4 E., S. B. M. It is accessible by automobile road from Hemet to Kenworthy, about 25 miles. The mine is at present worked part of the year by Mr. E. E. Chilson, of Kenworthy. It is equipped with a 5-stamp mill. Water is obtained from a mountain spring. The gold is in quartz veins in gneiss which occurs in contact with granite. The veins are seldom more than 6" to 8" wide, and the average value of the ore is \$15.00 to \$20.00 per ton. Some high values are said to occur in pockets.

GOLD MINES OF THE EASTERN DESERT.

The desert area of central and eastern Riverside County has an average length from west to east of about 100 miles and a width from north to south of about 45 miles.

In many of the mountain ranges which, here and there, rise above the desert wash, which has filled the intervening valley, are exposed metalliferous veins carrying gold, copper and silver-lead. Gold is the more frequent metal in its occurrence and is found at many points, though, up to the present time, no great production has been achieved.

The mineralized areas or districts, which have been worked at times, are as follows, it being remembered that a mineralized area is necessarily in a mountain range.³

Piñon Mountain.

Monte Negro or Twenty-nine Palms District.

Eagle Mountain.

Chuckawalla or Hathaway Mountains, Chuckawalla District.

Hodges Mountain or Palo Verde Mountains.

Palen Mountains.

Ironwood or McCoy Mountains, Ironwood District.

Santa Maria Mountains.

Arica Mountain District.

Riverside Mountains, Bendigo District.

PIÑON MOUNTAIN DISTRICT,⁴

The mines are 12 to 14 miles northeasterly from Indio, about 5000 ft. above sea level. The more prominent veins have a northwest strike and variable dip. They are in branching fissures of a type common in

³A number of the properties mentioned in the Reports of the State Mining Bureau as being in this region have long been abandoned and are now forgotten.

⁴R. XII, p. 224; XIII, p. 313.

massive rocks such as granite.⁵ From the several claims of this group some very high-grade rock has been taken, which was crushed in a 2-stamp mill a mile from the mines. The deepest work on these veins is 70 ft. from the surface. Tingman, of Indio, owner.

The Hexahedron Mine: See Report XII, p. 223; XIII, p. 311. Seven miles northeast of Piñon Mountain, 25 miles northeast of Indio. The ore is in a mineralized felsite dike, which strikes nearly east and west. At the west end it is small (not over 4 ft.), but widens toward the east. The ore shoot lies in a hillside. It is 75' long, 15' to 20' wide, and dips 45° N. At the place where gold was found, it lies exposed along the north slope of the hill, the overlying rock having been eroded. Dikes of green diorite, much decomposed at the surface, cut the felsite and adjacent rock irregularly and, in this vicinity, the felsite contains gold. Iron oxide, copper carbonate and dendritic infiltrations of manganese oxide are the indications of mineralization. Portions of the rock are spangled with small points of gold. In the vicinity of this mine are some prospects on which a few holes have been sunk. Owner, Indio Mining and Milling Company; president, J. S. Garrison, Victorville; Roy Garrison, superintendent at mine.

Lost Horse Mine (Field No. 24): See Report XII, p. 223; XIII, p. 312. This property is in Sec. 31, T. 2 S., R. 9 E., 19 miles north and a little east of Indio in a direct line, and about 28 miles by wagon road and seven miles north of Piñon Mountains, at altitude 5000 ft. The vein strikes east and west and dips 85° N. It cuts through laminated micaceous quartzite, which strikes north and south. Occasional dikes of granite are present, but the vein cuts all the other formations. It is exposed at several points for a distance of 800 ft. along its course. Its width varies from 6 in. to 5 ft., and exhibits an overlapping tendency, the footwall becoming the hanging wall of the next shoot below. The workings consist of an 80-ft. tunnel, a 50-ft. winze and a 50-ft. drift, east from the bottom of the winze. Most of this work is in good rock. There is also a vertical shaft 235 ft. deep. Between 1890 and 1900 about \$350,000 were produced. With more abundant water and a larger mill, this property, which consists of two claims, might become a large producer. Owner, J. D. Ryan, Union Oil Bldg., Los Angeles.

MONTE NEGRO DISTRICT.⁶

This is near the north boundary of Riverside County, in R. 12 E. This mining district was organized about 1890 and considerable development work was accomplished by the claim owners. At present little if anything is being done.

⁵W. H. Storms, Bull. 18, pp. 22-26; Min. & Sci. Press, May, 1906, p. 348.
⁶R. XI, p. 368; XII, p. 224; XIII, p. 313.

The Monte Negro camp was on the south side of the range of hills 45 miles northeast of Mecca Station, 20 miles north of Eagle Mountain, and about 6 miles south from Virginia Dale. It is 35 miles south from Cadiz Station on the Santa Fe. The mineral belt is about $1\frac{1}{2}$ miles wide and 5 miles long; the veins trending north and south.

This district has attracted much attention through the discovery, on one of the claims, of masses of gold-bearing quartz of extreme richness.

From Mecca Station, 189 ft. below sea level, the road ascends till, in 27 miles, a divide is reached near Cottonwood Springs, at an altitude of 3157 ft. Thence it again descends 19 miles to the foot of the wash, which extends 2 or 3 miles from the base of the mountains, where the altitude is 1300 ft. The altitude at the camp is 1520 ft. The mines lying back in the mountains are at higher, though varying altitudes, the greatest elevation being 3500 ft., at the Ramona or Ingersoll mine. Neighboring peaks rise from 200' to 800' higher.

The rocks exposed in the Monte Negro uplift are chiefly eruptive, diorite, quartz porphyry and fine-grained porphyritic rocks, cut by later dikes of felsite and a dark green or black eruptive.

Epidote occurs abundantly throughout the region, usually associated with micaceous iron ore, which occurs everywhere in veins and bunches. This iron ore contains no precious metals, and is of no economic importance.

The region although entirely eruptive and in part volcanic (large fields of basalt occurring on the western slope) is in the immediate vicinity of a mountain called Pinto, or Painted, composed of metamorphic strata, chloritic and hornblende rocks, quartzite and mica schist predominating.

The mineral veins of the Monte Negro District are all of the fissure type, and are simple in form. The gangue is quartz, carrying iron and copper sulphides and their secondary products, iron oxide and copper carbonate, together with gold and silver. No lead or zinc was observed. The value of the ore lays in its gold content, silver occurring very sparingly and the bullion from this ore was worth about \$17.00 per ounce. The ore ranged in value from \$20.00 to \$100.00 per ton.

Wood was not obtainable in the vicinity of the mines and water was scarce, but was obtained by sinking a well in a basin near Virginia Dale, a few miles north, where there are 2 mills. In the wash, 3 miles south of the most southerly Monte Negro mines, a shaft was sunk 140 ft., but no water was obtained. Bedrock was not reached at that depth, and it is probable that water may be secured by continuing this shaft downward. On the south, the nearest water is 22 miles away at Cottonwood Springs, where the ore has been worked in an arrastra.

The principal mines of this district which is now idle, were the Great Eastern, Venus, Columbus, Summit, Porcupine, Schiller, Hillerman, Annie Rooney, Ethel, Republican, Ramona, McKinley Bill and Revenue. Few men now remember these properties.

Ingersoll (Ramona): See Report XIII, p. 313. Vein stated to strike north and south, nearly vertical, and 1' to 3' wide. Shafts 40 ft. and 80 ft. deep. Former owners, Elser Ingersoll et al., San Bernardino. Not known at present.

O. K. (McKinley Bill): See Report XIII, p. 313. Vein in diorite, 1' to 4' wide. Two shafts, 30' and 40' deep. Ore hauled to Virginia Dale mill. Owner, Elser Ingersoll et al. of San Bernardino. An old mine now forgotten.

S. S. Mine: See Report XII, p. 224; XIII, p. 314. This was in the Monte Negro region, 4 miles south of Virginia Dale, discovered during 1894. It has produced some very high grade ore. T. R. Lyon, of San Bernardino, former owner. Now forgotten.

Gold Galena Mining Co. Near the south boundary of San Bernardino County, is the property of this company. They have offices at 230 Douglas Bldg., Los Angeles; president, F. C. Longnecker, 6016 Romaine avenue, Los Angeles; secretary, B. A. Straus, and manager, C. E. Stead. The properties are nine claims in Secs. 4, 8 and 9, T. 3 S., R. 9 E., S. B. M. The feature of this ground is a vein of substantial width which contains galena carrying gold. The workings are down from 70' to 100'. There is no mill and no bullion has been produced up to date.

New El Dorado Consolidated Mining Co. This comparatively new company is operating in Sec. 17, T. 3 S., R. 10 E., S. B. M. Little more than assessment work has been done and no production has been attained. The company has an office in the Central Building, Los Angeles. Mr. Fred Vaile is manager.

CHUCKAWALLA DISTRICT.

The Chuckawalla Mountain Range lies in T. 5 to 8 S., R. 15 to 19 E., S. B. M. It was formerly known as the Hathaway Range, and is so named in the early reports of the State Mining Bureau. Its present name is a corruption of Chuckwalla, the Indian name of a lizard which frequents these hills. In its northwest portion lying in T. 5 to 7 S., R. 15 and 16 E., S. B. M., is a mineralized area in which gold, copper and silver-lead occur and where prospecting and mining have been conducted on a limited scale for many years. It was once known as the Pacific Mining District and, in the Xth Report, pp. 900-901, are some notes on it by C. R. Orcutt, made during a visit in 1888, at which time it was in San Diego County. In these notes are mentioned

a number of properties, and Mr. Orcutt's descriptions are here given in abbreviated form, though the claims are mostly forgotten:

"Sunnyside: Ore iron-stained quartz, with argentiferous galena, said to have average \$50.00 per ton in gold and silver. A 20-ft. shaft was sunk on the vein. The mine was owned by Hendsch & Frederick, of San Diego, but it is now abandoned.

"Opulent: An extension of the Sunnyside. From this mine came the first specimens of wulfenite, recorded from San Diego County. A little galena occurs here. Once owned by Milton Santee, of San Diego, and W. F. Hendsch.

"Golden Rule: A claim worked years ago with good results; 50 ft. shaft. Malachite and chrysocolla occur here.

"Red Cloud: So named from the abundance of cuprite. A 30-ft. shaft was sunk, and a tunnel commenced.

"Alice: Ore contains an abundance of chrysocolla. It was said to carry both gold and silver in paying quantities. Owned by Santee and Hendsch.

"Champion: A blind lead of good promise. It yielded gold, silver and lead in paying quantities. Argentiferous lead ores and also wulfenite were characteristic here.

"Great Western: A ledge 50 ft. or more in width yielding an average of \$20.00 per ton in gold, with a trace of silver. The Keystone, Blackbird and Monarch claims are on similar veins."

In the southern part of T. 6 S., a cañon traverses the range from southeast to northwest. In and near it are a number of mining properties, and 3 miles from its northwest end are Mill Springs, near which are several of the claims described by Orcutt. About 10 years after his visit, some 40 claims in this area were taken over by the Red Cloud Mining Company, of which S. P. Cressinger was president. Several of these are now held by J. M. Huston, of Los Angeles, under the name of the **Redhead Group**, which includes the Great Western, White Wing, and Red Head.

Sterling: See Report XIII, p. 314. Considerable superficial work, and a 10-stamp mill. Former owner, Sterling Mining Company, Los Angeles. This was once a part of the Red Cloud Group. The mill was later moved to the Lost Horse Mine, in the Piñon District.

About 2 miles from the east portal of the cañon are the well known **Corn Springs**, at present held under a placer location by J. M. Huston, of Los Angeles. About 2 miles south of Corn Springs is the Bryan Mine, which was operated from 1898 to 1900 by Adams & Pickering, the ore being treated in a two-stamp mill at Corn Springs. It now belongs to J. M. Huston.

One and a half miles southwest of Corn Springs are claims once operated by the **Happy Jack Mining Company** and the **Chuckawalla Mining Company**, and now controlled by Dr. Wood, of Long Beach, and H. I. Seward, of Los Angeles. The ore from these properties was treated from 1896 to 1898 in a small rotary mill. Development here reached a depth of 300 ft.

Coffee: See Report XIII, p. 310. Chuckawalla Mountains, 4 miles west of Corn Springs. The vein strikes northwest. Shaft, 56 ft. on 18 in. vein at northwest end of claim. This was worked jointly with the Richey Mine. Former owners, Coffee & Co., Salton.

Bankers Group: About one mile south of the Coffee and Richey mines are the claims of the Bankers Mining Company, of Los Angeles. President, A. A. Irish, 402 Grosse Bldg., Los Angeles.

Near the northwest extremity of the mountain range, in Sec. 35 or 36, T. 5 S., R. 15 E., is the **Granite Mine**, on a vein trending north and south. This mine, having been worked at intervals for several years and having passed through the hands of several owners, now belongs to Silas Masters, of Riverside.

A few miles east, on the north slope of the mountain, some surface springs have been gathered into what is known as the Granite Tanks.

San Diego: See Report XII, p. 224; R. XIII, p. 313. This mine is on the same vein as the Granite adjoining it on the southeast. The rock is of high grade, heavily oxidized. Former owner, E. E. Bowles, of San Diego.

Boulder: See Report XIII, p. 310. This claim is in the Chuckawalla Mountains, at 2000 ft. altitude, about one mile west of the Granite Mine. The veins strike north and south and dip nearly vertical. There are three shafts: 30', 50' and 100', also a tunnel 200' on the vein, and open cuts. Formerly owned by the Boulder Mining Company, of Los Angeles. This mine gave its name to the Boulder well in Sec. 31, T. 4 S., R. 16 E., S. B. M., now held by the Southern Pacific Railroad.

Lane: See Report XIII, p. 312. A prospect on Chuckawalla Mountain, with superficial development. It lies between Granite Mine and Corn Springs, about 4 miles northeast of the latter. The quartz was treated in an arrastra. Former owners, Lane & Son, of Salton.

Throughout the rest of the Chuckawalla Range, in a distance of some 20 miles, no deposits of any interest have been opened.

HODGES MOUNTAIN.

The next mineralized area to the southeast is in Hodges or Palo Verde Mountain, which lies in T. 7 and 8 S., R. 21 E.

The following properties are in this mountain:

	Owner.
Double Eagle-----	Justus Smith, Palo Verde
Palo Verde Group-----	Justus Smith, Palo Verde
Punch-----	A. P. Wiley, Palo Verde
Senate Mine-----	A. P. Wiley & L. A. Stanchfield, Palo Verde
American Flag M. & M. Co.-----	C. A. Ludden, Pomona

No production has been reported, and probably only assessment work has been done.

Dos Palmas, Gold Prospect near: See Report XII, p. 221. There are several gold claims 18 miles north of the old Dos Palmas stage station, which have been described as valuable prospects. The veins are of good size, and the ore of good grade. Water is obtainable within 6 miles of Cañon Springs. One of the claims is described as being on a ridge between two cañons 1500 feet apart. The vein is 3' to 6' wide, and the pay shoot 1' to 3'. Two tunnels, one of 90' and the other of 190', have been driven on the vein.

Free Coinage and Charity Mines: See Report XII, p. 221; XIII, p. 311. There are two locations, made in 1893. They adjoin, about 5 miles north of Cañon Springs, 12 miles northeast of Dos Palmas, and 18 miles north of Durmid Station. The Free Coinage vein had 28" of free-milling ore and a 6" vein of quartz, containing galena and carbonate of lead, which carry some silver. E. E. Bowles, of San Diego, owner.

Fish: See Report XII, p. 221; XIII, p. 311. Six miles northeast of Dos Palmas and 12 miles northeast of Salton. Elevation 1000 feet, 90 feet of tunnel and other superficial work on a quartz vein. Two-stamp mill with gasoline engine at Cañon Springs, 6 miles from mine. Owner, A. C. Fish, San Bernardino.

Messenger: See Report XIII, p. 312. Eagle Mountain, 40 miles northeast of Mecca, vein 3' to 4' wide; shaft 100 ft.; drifts 50 ft. north and south. Owner, W. H. Bradley, Boyle Heights, Los Angeles. This is in the Iron Chief Group of claims.

ARICA MOUNTAIN DISTRICT.

Mr. Clarence A. Waring writes as follows:

The Gray Mine is located in Sec. 7, T. 2 S., R. 10 E., about 6 miles southwest of Blythe Junction, at an elevation of about 1500 feet. It is accessible by a rather sandy automobile road from Blythe Junction. When visited during the latter part of November, 1914, the mine was leased to "The Assets Realizing Mines Company," the president of which is Mr. J. V. Priest, Los Angeles Investment Bldg., Los Angeles.

The mine is being actively worked with 10 men and preparations were being made to ship ore.

Work is being done on 2 different parts of the property. The upper workings consist of a 340-foot vertical shaft with about 700 feet of drifts along the strike of the quartz ledge which is N. 20° W. These workings are equipped with one 60 h.p. and one 25 h.p. Fairbanks gas engine, an air hoist and a 4-drill compressor. Compressed air is piped from this plant to the lower workings where 2 drills are used in drifting. It is said that these workings consist of about 300' of drifting and cross-cutting and a 227' winze.

The ledge on which the work is being done varies from 6" to 2' wide, and the average assay is said to be about \$8.60 per ton. The ore is free milling down to 150 feet, below which sulphides predominate. The hanging wall and footwall are both of schist. Water is pumped from Brown's well about $4\frac{1}{2}$ miles to the southwest. This well is 328 feet deep and is on the stage road from Blythe Junction to Blythe City.

The Brown Mines. Located on the same ledge as the Gray mine, the Brown mines adjoin it to the north and south. Mr. Floyd Brown's mine to the south has a three-stamp mill, and some of the free milling ore on the surface has been worked. Mrs. Floyd Brown's mine is located north of the Gray mine. The work at both the Brown mines has consisted mainly of assessment work. Mr. Floyd Brown resides at Blythe City.

SANTA MARIA MOUNTAIN DISTRICT.

A few gold prospects are reported in the Santa Maria Mountains. Between the "Little Marias" and the north end of the McCoy Mountains in the NW. $\frac{1}{4}$ of Sec. 8, T. 4 S., R. 20 E., some placering was done by the Crescent Copper Company in the early days.

THE BENDIGO DISTRICT (RIVERSIDE MOUNTAINS).

Mr. C. A. Waring reports as follows: The formations exposed in the northern part of the Santa Maria and Palen mountains are said to recur in the Riverside Mountains to the northeast. The latter mountains are said to consist of schists and limestones, which are folded and faulted to a considerable extent. They are said to be more mineralized than the mountains to the south.

The following groups are known:

Calzona Mines. The Calzona mines property, formerly known as the McKesson Group, was discovered in 1898, and includes 12 claims and 13 mill sites. These are located mainly in the S. $\frac{1}{2}$ of Sec. 31, T. 1 S., R. 24 E., and in the SE. $\frac{1}{4}$ of Sec. 36, T. 1 S., R. 23 E. The names of the claims are the Sanborn, Contact, Golden Gate, Burke, Burke Extension, Saddle Rock, Copper Reservation, Globe, Copper Belt, Black Butte, Riverside, and Blackwell. The property is owned by Dr. Robert

M. Vermilyea, of Redlands, president; F. C. Lee, of Vista, secretary-treasurer, and A. W. Martin, of San Diego.

In February, 1914, it was reported that 4 men were employed in mining on the property, and that several tons of ore had been shipped. The ore is said to have brought \$60.00 per ton. The values of gold and copper are said to be in limestone along its contact with schist. The ledge is pockety and possibly the values represent picked ore. The ledge is faulted down against schist at a depth of about 1500 ft. The ore is mined by an 800-ft. tunnel and a 200-ft. shaft. Water is pumped about $2\frac{1}{2}$ miles from the Colorado River to the east. The nearest railroad station and post office are at Vidal, about $6\frac{1}{2}$ miles to the northeast. Good automobile roads lead from the mines, which are at an elevation of about 1200 ft., to the railroad stations at Vidal and Calzona.

The Jackknife Group. This group of claims owned by Messrs. Cal Morgan and H. D. Bradley, of Calzona, is located principally in Sec. 1, T. 2 S., R. 23 E., and Sec. 6, T. 2 S., R. 24 E. It includes the Combination, Combination Fraction, Jackknife Extension, Jackknife Nos. 1, 2 and 3, Margie, Single O, Betsy and other claims to the southwest in Sec. 1, T. 2 S., R. 23 E. They are at an elevation of about 1200 ft. and about 6 miles southwest of Vidal, the nearest post office and railroad station.

In February, 1914, it was reported that four men were employed, and that several tons of ore had been shipped to date, and that the ore brought \$66.00 per ton. It is said that the gold is now recovered by chloriding. The values in gold and copper are in pockets along the contact of limestone and schist, which strikes N. 55° E., and dip about 50° . Probably the material shipped was selected ore which would account for the high average value. The ledge on which the Morgan and Bradley mines are located is over 1000 ft. lower in the formation than that on the Calzona property. The ledge is faulted down against schist at a depth of about 1700 ft. Water is pumped about 3 miles from the Colorado River to the east. A 6 h.p. Fairbanks-Morse gasoline engine is installed on the property.

The Steece Mines. The Steece property is located southeast of the Jackknife Group, principally in Sec. 6, T. 2 S., R. 24 E. It includes the Ruby, Washington, Bluebell, and Black Warrior claims, and 8 others. It is owned by Richard Silliland and Ed. Arnold, of Calzona.

It is said that the main shaft is down about 500 ft., and that water is pumped from the Colorado River. The ore body follows the contact between schist on the south or footwall side and limestone on the north. The ledge strikes N. 55° E., and dips at an angle of about 50° . The ledge is about 1800 ft. lower in the formation than that on which the Jackknife Group is located. The ledge is faulted down against schist at a depth of about 3700 ft.

The Gold Dollar Group. This group consists of eleven claims, Gold Dollar Nos. 1 to 10, and Gold Dollar Fraction, in Secs. 35 and 36, T. 1 S., R. 23 E., and Sec. 1, T. 2 S., R. 23 E., S. B. M. They are owned by Messrs. Ware and McMillan, of Calzona. Only assessment work so far has been done.

The Oxbow Group. This group consists of the Oxbow, Oxbow Nos. 1 to 6, and the Oxbow Fraction claims near the center of Sec. 36, T. 1 S., R. 23 E., S. B. M. The claims are owned by Messrs. John and Dennis Burke, of Calzona. Only assessment work has been done.

Alice Group. This group consists of 8 claims in Secs. 25 and 36, T. 1 S., R. 23 E., S. B. M. The names of the claims are the Lucky Boy, Comet, Good Enough, Fraction, Longworth, Homestake, Alice, and Mineral Hill. The group was formerly known as the Pipineo Group, and is owned by Mr. B. L. Vaughn, of Needles, California. The mines, at an elevation of 1600 ft., are 6 miles south of Vidal, the nearest railroad station. Water is pumped about 5 miles from the Colorado River. In February, 1914, it was reported that 3 men were working at the mine, and that 90 tons of ore had been shipped to Needles. The gold is said to occur in schist.

Meek and Sass Mines. Messrs. Meek and Sass of Los Angeles hold the Earnie and Melville claims and others in Sec. 1, T. 2 S., R. 23 E., adjoining the Morgan and Bradley claims.

Four **placer claims**, namely, the New Moon, Sunset, Riverside and Midnight, have been taken up in Secs. 20, 29, 30, 31 and 32, T. 1 S., R. 24 E.

IRON.

This most important metal is found in this county in a deposit of great importance, which lies in the desert region of Riverside County, T. 3 S., R. 14 E., forming part of an elevation known as Eagle Mountain. It also occurs in Turtle Mountains near the county line of San Bernardino.

IRON ORES OF EAGLE MOUNTAIN.

The important iron ore deposits of this area are large and valuable and when commercial conditions improve and proper fuel becomes available they will form the basis of an important industry for the Pacific Coast.

A careful study of this region was made for the U. S. Geological Survey in 1909 by E. C. Harder and J. L. Rich. The results of that work are published in U. S. G. S., Bull. No. 503, accompanied by colored geological maps and sections; and to which the reader is referred for full details.

These deposits are in the northern part of the Eagle Mountains, central Riverside County, T. 4 S., R. 14 E., about 40 miles northeast of

Mecca, on the Southern Pacific Railroad, 45 miles south of Cadiz, on the main line of The Atchison, Topeka and Santa Fe Railway, and 50 miles southwest from Blythe Junction on the Phoenix Branch of the latter railway. This recently completed branch connects with the main line at Cadiz, passing about 35 miles northeast of the Eagle Mountains.

The area is best reached from Mecca, on the Southern Pacific Railroad, by about 50 miles of road. The Iron Chief mine may also be reached from Dale, San Bernardino County, about 20 miles north. Dale is 45 miles from Amboy, on the Santa Fe Railway, with biweekly stage service. The east end camp may also be reached from Parker or Blythe Junction by wagon.

These deposits are considered the largest in the southern section of the state.⁷ "The iron ores with associated metamorphic minerals occur as replacements in the dolomite. Locally, as at the east end of the area, they have replaced the entire series of dolomite lenses, leaving the associated quartzite but little altered. Elsewhere they occur within the dolomite lenses or beds, in bands or as irregular masses roughly parallel to the bedding. * * * The trend of the iron-bearing belt along the north limit is approximately N. 70° W., its extent in this direction being about 6½ miles. Its width of outcrop varies from 500 feet to 2500 feet. * * * The ore is predominantly hematite, but here and there consists of masses of magnetite. Much of the hematite contains disseminated magnetite, making it slightly magnetic, but probably less than 10% of the entire quantity of ore is magnetic. A considerable percentage is very pure and of high grade, containing between 62% and 67% metallic iron and less than 0.06% phosphorus. Much of the ore, however, is mixed with gangue material, such as metamorphic minerals and unreplaced rock. The principal minerals occurring with the ores and metamorphosed dolomite are serpentine, mica, amphibole, garnet, epidote, pyroxene, and titanite."

Several groups of claims have been located on these deposits, and a relatively small amount of development work done. These claims are described in detail in the bulletin referred to above.

MANGANESE.

Ore deposits of this important metal, so necessary in the manufacture of steel, are found at several points in Riverside County, but only one has as yet been developed into a producing mine. This is known as the **Black Bird Mine**, and is in the McCoy Mountains, 12 miles west of Mineral, a station on the Southern California Railroad, the new railroad now being constructed from Blythe Junction to Blythe. It is said that 1000 tons of manganese were shipped from this deposit during the spring of 1916 and that it is now exhausted.

⁷E. C. Harder, op. cit.

One locality, long ago known and located, is northeast of Elsinore, in Secs. 23 and 24, T. 5 S., R. 4 W.

The following description of the exposures has been written by a Los Angeles mining engineer, F. E. Fielding, and partly verified under the present writer's direction:

One group, of 6 locations, lies west of The Atchison, Topeka and Santa Fe Railway, the other group, of 9 locations, lies on the east of the railroad about $\frac{1}{2}$ mile farther north; one portion of the property reaches the railroad, while the farthest point of any location is less than $1\frac{1}{2}$ miles distant. For convenience in description the 6 locations west of the railroad may be designated as West Group and the 9 locations east of the railroad as the East Group.

(Sec. 23.) On the **West Group** was visited what was pointed out as the principal vein, though another parallel vein is said to exist. This vein outcrops at the top of a hill some 1500' to 2000' distant from and approximately 400' to 500' above the railroad. Here is an outcrop of 3 ft. wide, upon which a hole 3 ft. deep has been sunk. Some 75' to 100' distant, toward the railroad, a 10-ft. shaft has been sunk showing the vein to be 4 ft. wide at the surface. Below this point is a tunnel 20 ft. in length driven in the footwall so the width of the vein is indeterminable.

(Sec. 24.) On the **East Group** are three parallel veins, outcropping at intervals for several hundred feet in length. The central vein outcrops show an indefinite width, being considerably broken and covered with detritus. This vein may be 16' to 20' in width, as the distance from the apparent foot to hanging wall would indicate. The width can only be determined by trenching.

The following report on manganese in eastern Riverside County is by Mr. C. A. Waring:

McCoy Mountains.

The Schellenger Claims. On the north end of the McCoy Mountains in Secs. 13 and 24, T. 4 S., R. 19 E., Mr. E. E. Schellenger, of Blythe, has 4 manganese claims. The deposits, which are from 4' to 8' wide, have a northwest strike. A 20-ft. shaft, sunk to one side of the outcrop, has so far failed to strike the ledge and it is thought by Mr. Schellenger that the ore body may dip rather steeply. The deposit is said to be in a region of faulting. The manganese ore is said to carry considerable barite and fluorite.

Prospects of manganese are also reported in the region southeast of McCoy Mountains, on the **Patterson ranch**, where considerable lime accompanies the deposit. Not enough work has been done to determine the importance of these deposits.

Palo Verde Region. Messrs. Lugo and Justice Smith have done assessment work on some manganese claims northwest of Palo Verde.

TIN.

The Temescal tin deposit was discovered about 1853 and in 1860 a company was formed to work the mine. The outbreak of the Civil War, the following year, caused operations to be suspended and nothing further was done until about 1880.

The earliest description of this deposit in 1884 by Henry G. Hanks, State Mineralogist, will be found in Report IV, p. 120. Other references to it will be found in Mineral Resources of the United States, U. S. Geological Survey, 1882, p. 434; 1883, p. 434; 1891, p. 161. Also, in U. S. G. S., Bulletin 260, and in U. S. G. S., Sixteenth Annual Report, 1894, Part III, p. 536.



Temescal (Cajalco) Tin Mine, looking northeast, Riverside County, California. Photo by Gerald A. Waring, July, 1916.

This deposit was carefully described in 1892 by H. W. Fairbanks, R. XI, pp. 111-113. Also, by the same author in the *American Journal of Science*, 4th Series, Vol. IV, pp. 39-42. For the position of this mine, see *Elsinore Quadrangle*, U. S. G. S.

From the data in the XIth Report, by H. W. Fairbanks, the following description is abridged:

“The Temescal tin mine is located in the western part of the Sobrante de San Jacinto grant, and about 5 miles southeast of Corona. This portion of the grant consists of rolling hills. On the west is a large body of porphyry, extending nearly to the Temescal Creek.

"The rocks exposed along the road to the mine east of Temescal Creek are mostly felsites and porphyries. These rocks are soon replaced by granite, in which are dikes of fine-grained, highly quartzose granite. A half mile south of the road is a cañon. Here the porphyry is seen extending up to the granite, which is greatly broken near the contact and, though there is no blending of one into the other, there is a confused mixture of broken portions of both rocks. Bunches and dike-like bodies of granite are enclosed in the porphyry. Small black veinlets of tourmaline aggregates are very numerous in the granite, extending through all the rock up to the porphyry, with a northeast strike. The material of these veinlets constitutes the gangue of the tin veins. The veinlets of tourmaline are aggregates of needle-like crystals and seem to have replaced the feldspar and mica of the granite, leaving the quartz. The veins grow larger toward Cajaleo Hill. Just west of the works is a great mass of the black veinstone, the gangue of the tin ore. This rises in high, rugged croppings, over an area of about 300' by 250'. This is the greatest body of vein matter to be seen in the district. The tin deposit worked lies in an eastern prolongation of this cropping. The country rock is a coarse hornblende-biotite granite. The course of the vein is N. 45° E., dip 65° to 70° NW., and it has the usual character of such deposits, swelling at times to a width of 8 feet, and again contracting to much less. The highest grade of ore is found in the narrow portions, where it is sometimes almost pure tin oxide, running as high as 70%. The vein matter does not wholly consist of tourmaline, but contains quartz grains scattered through it in about the same proportion as in granite. Tin is not found to any extent in the quartzose part of the gangue, but occurs in bunches and stringers, or disseminated in the irregular veinlike bodies of tourmaline, which lie in the quartzose gangue. This is particularly the case where the width of the vein is 6' to 8'. Where it pinches, the whole vein sometimes consists of the tourmaline aggregate and tin ore. The vein usually has clay gouges on both walls; sometimes it is frozen to one wall; wherever the walls come together and cut out the vein matter, the gouges remain.

"There are here two varieties of tin ore: the yellow, occurring in thin layers in an uncrystalline form, and the brown, in granular form in the massive specimens, or in small, clear, reddish brown crystals lining cavities. In the later case it forms handsome specimens. A small amount of arsenopyrite is present at places in the vein, and pyrite in the granite. The quartzose portion of the vein matter often blends into the granite walls, and there are bodies of evidently granitic origin wholly enclosed in the vein matter. A careful study of the vein matter, and its relation to the walls, shows that it is a portion of the granite, in which tourmaline has been substituted for the feldspar and for the dark silicates, hornblende, and mica. The

quartz has the same character and color as that in the granite, and many transition stages in the process are shown. Where the action has been more intense, near and along the fissures, the quartz also has been wholly removed and the tourmaline deposited, together with the tin. Cajaleo was the center of this action. The veins decrease in size farther away."

At the time of Mr. Fairbank's visit in 1892 the mine had been opened up to a depth of 180 feet, by two working shafts. The total length opened on the vein was 300 feet. Two levels had been driven and work was in progress on a third. The main ore body lay in the center of the workings and extended downward in the dip of the veins. The ore milled averaged 5% of tin oxide, though large portions, as before stated, were of very high grade. The company prospected Cajaleo Hill by a tunnel and by open cuts, and one or more of the veins south by shafts. At the time of the visit two of Husband's pneumatic stamps were in operation. They weighed 900 pounds each and dropped 135 times per minute.

South and southwest of the works are many bunchy veins of the black vein matter. They often carry considerable iron. They extend, generally, nearly parallel, in a northeast and southwest direction. Some appear as mere bunches on the surface. These veins closely resemble the main vein at Cajaleo Hill, and are due to the same action, and it is supposed that many of them will be found to carry tin, though it does not appear on the surface. About 2 miles south the granite is replaced by a banded porphyry, which cuts off the tourmaline veins. The granite about the works, and especially toward the contact with the porphyry, is cut by many dikes of fine-grained granite, having an excess of quartz and feldspar. Associated with the porphyry are metamorphic strata of a hard, dark, quartzose character. A quarter of a mile northwest of the mine is a bunch-like outcrop of porphyry, carrying silver and copper carbonate. The black veins outcrop for a distance of 2 miles northwest from the mine, extending into the porphyry, which replaces the granite in that direction. The granite extends eastward for many miles.

In brief, the general geologic features here are: A semicircular area of granite over 2 miles in diameter, surrounded on the northwest and south by porphyries and adjoining on the east a great body of granitic rocks extending indefinitely in that direction. Around the border of this granite boss are many dikes of fine-grained granite. Cutting through the granite in a northeast and southwest direction are black tourmaline veins, which form the gangue of the tin ore when it is present.

Tin occurs here under conditions different from those in any other known deposit. Tin veins are almost always found in granitic rocks, but so extensively developed a tourmaline veinstone is remarkable.

The direction of the fissure system shown here is uncommon in California. The veinstone, together with the associated metals, has probably resulted from a process of sublimation along line of fracture, removing those portions of the granite easily affected, over a large area, as at Cajaleo Hill, and in the immediate contact completely replacing it with the massive aggregate of minute tourmaline crystals.

NONMETALS.

Under this head are included the more valuable of this county's mineral products. Clay alone aggregated in 1914 a total of nearly \$70,000 and the other nonmetallic minerals amount in value to a very substantial sum.

The principal materials under this head are Clay, Gypsum, Cement, Stone, Magnesite, and Gems.

ASBESTOS.

About 15 miles in an air line S. 14° E. of Palm Springs are the old workings of an asbestos mine, now held by **Frank H. Jackson** of Los Angeles. It is most easily reached from the railroad at Hemet, whence there is a good wagon road as far as Kenworthy. The road from Kenworthy to the workings is very rough but passable with a team and a buckboard. The topography of the region is mapped on the San Jacinto and Indio special maps of the United States Geological Survey.

The picture, Fig. 4, was taken from the road looking northward toward Palm Springs, lost in the haze to the left, and Asbestos Mountain to the right. The cross marks the location of the asbestos workings, a portion of which is shown in Fig. 5.

The country rock exposed in the Santa Rosa Mountains is chiefly granite. About $\frac{1}{4}$ mile southwest of B. M. 3871, southwest of Piñon Flat an area of metamorphic limestone with surface exposure about $\frac{1}{2}$ mile wide (see Fig. 4) strikes N. 45° W., with a dip of 50° NE. This limestone overlies the granite unconformably and is overlain by a coarse granitic gneiss which is well exposed in Omstott Creek and on the southwest side of Piñon Flat. The gneiss contains a great deal of biotite with some orthoclase.

The asbestos occurs in veins as slip-fiber traversing a granular dull green cortlandite (olivine-hornblende) rock carrying some secondary magnetite. It is the amphibole (tremolite) variety and in places along the larger veins aggregates of the acicular gray crystals can be obtained two feet or more in length. The hardness is about six and the crystals fiberize with difficulty. After the asbestos has been exposed to the weather it softens up into a loose white fiber. Owing to the fact that the fibers are quite brittle and rather easily fusible probably the best



Fig. 4. View northward from head of Palm Cañon, Asbestos Mountain to the right. The cross marks the mine workings. The streak of white cutting across the head of the cañon is limestone. Photo by C. A. Waring.



Fig. 5. Face of cut where asbestos has been mined, Riverside County. The prospector's pick marks the main ledge of asbestos, and small stringers appear throughout the mass of cordlandite. Photo by C. A. Waring.

use to which the product could be put would be as a protector against acids.

The largest vein of asbestos seen in the mine was two feet thick and below it were about three feet of talc. Both hanging wall and footwall are cordlandite. The deposit has been opened up by means of tunnels and open cuts. The first product of the mine, in the early days, was packed out as far as the head of Vandeventer Flat and shipped to San Diego where it was used in mineral paint. Only assessment work is

at present being done, and about thirty tons of asbestos are piled ready for shipment. Seven claims have been located along the deposits. The natural point of shipment at the present time would be from some point along the Southern Pacific Railroad about fifteen miles to the northeast. The claims are owned by Mr. E. E. Chilson, of Kenworthy.

CEMENT.^s

Cement, as used in building, is a compound of lime, alumina, and silica that hardens in contact with water. It differs from quicklime in that it does not slake, expand, crumble, nor give off heat when wet, but chemically combines with part of the water into a firm, artificial stone. There are two principal classes of cements: the natural rock, or Rosendale cement; and the artificial product or Portland cement, to which may be added a third, the Pozzuolana or slag cement.

NATURAL ROCK CEMENT.

A limestone which in nature contains sufficient clay or other aluminous material, mixed with the carbonate of lime, so that it requires only burning and grinding to form a cement, is called a waterlime, or natural cement rock, and the product is natural or Rosendale cement, sometimes called Roman cement. Natural cement rock was discovered in the United States near Chittenango, N. Y., in 1818. Later it was found in large quantities elsewhere in New York and in Pennsylvania, Indiana, Kentucky and other states. Ulster County, New York and Louisville, Kentucky, were for a long time the center of this important industry. Natural cement is generally inferior to Portland, and in most places, its market has been taken by the artificial product.

In California such a natural cement rock occurs in Orange County, where, near El Toro, a deposit, claimed to be of good quality, is found. In 1860 and for several years following a natural hydraulic cement was obtained at Benicia, Solano County, and utilized in building operations in San Francisco.

PORTLAND CEMENT.

Portland cement is a compound consisting chiefly of silicates and aluminates of lime, produced by the calcination to incipient vitrification of a mechanical mixture of calcareous and argillaceous materials, the clinker thus produced being subsequently ground to a fine powder. Its chemical composition varies considerably, the principal constituents being lime, silica, alumina, and oxide of iron, which are apparently in the following proportions: lime, 60% to 64%; silica, 20% to 24%; alumina, 6% to 10%; iron oxide, 3% to 5%. These constituents, as a rule, amount to about 96%, the remainder consists of small quantities of sulphuric anhydride, magnesia, alkalies, etc.

^sBull. 38, pp. 171-173.

The use of Portland cement is principally based on its characteristic quality of hardening rapidly under water or in a moist atmosphere.

Portland cement was first manufactured in England, and so named in 1824 by Joseph Aspdin, of Leeds, who patented a calcined mixture of limestone and clay. The name was based on a resemblance of the set cement to the famous Portland limestone used in building. The growth of the industry was at first slow. Not until 1851 was it brought prominently before the world, and, soon after, its manufacture began in Germany, France and elsewhere on the continent. The increase in output was rapid from this time, especially in Germany and England, which exported large quantities to the United States.

In America, the first Portland cement was manufactured in 1875 by Mr. Saylor, at Siegfried, in eastern Pennsylvania. Soon after, a second factory was established in western Pennsylvania. For nearly twenty years the growth of the industry was slow, but during the last decade of the nineteenth century there was a phenomenal increase in the product. This was due to the greatly increased use of cement, which, without marked decrease in importation, increased the home product in one decade more than 1200 per cent.

The enormous increase in the domestic production of Portland cement is a matter of much interest, yet, when one considers the varied uses to which it is put, and the many other ways in which it might be used, it will be a matter for great surprise if the increase in production does not continue for many years.

Uses of Portland Cement.

Because of the ease with which it can be moulded or formed into desired shapes, its hardness and durability when set, and its resistance to moisture and vermin, Portland cement will increase in importance in structural and engineering work. It has not only replaced ordinary lime mortar in masonry, especially in foundations, but in the form of concrete is replacing stone and brick and, for many uses, wood and iron in building.

Cement is used in the manufacture of artificial stone, and in concrete, which is used for monolithic structures, in walls, foundations, bridge construction, reservoir dams, etc.

The composition of Portland cement is already given above. Variations in the different constituents influence the character of the cement to a certain extent. Cements rich in lime set more slowly, but harden better than those poor in lime. Cements rich in silica set more slowly than those rich in alumina, but they are better for use under salt water. The addition of 0.33% to 0.75% of fluorspar is helpful in making the materials clinker more easily. Gypsum or sulphate of lime in small quantities somewhat delays the setting of the cement and

adds to its final strength. More than 4% or 5% is injurious, and many specifications require that less than 2% be added.

Riverside Portland Cement Co., Tyler Henshaw, president; W. H. Metcalf, secretary; corporation office, Mills Bldg., San Francisco, Cal.; John Treanor, manager; business office, Trust Ins. Bldg., Los Angeles.



Riverside Portland Cement Co. plant as seen from Fairmount Park.



Quarries of Riverside Portland Cement Co. Upper quarry, limestone; lower quarry, diorite.

Quarry and works at Cement Plant near Crestmore, F. F. Parker, superintendent.

This company was organized in October, 1909, and its quarry and plant are about 5 miles northwest of Riverside, in Secs. 2 and 3, T. 2

S., R. 5 W., S. B. M. The limestone which is coarsely crystalline, is quarried in a butte similar to many which occur in this region, but which are generally of granite. This limestone butte near Riverside, in some respects, resembles Slover Mountain southwest of Colton, which is the source of limestone for the California Portland Cement Company. Both show mixtures of blue and white calcite, but the Riverside County stone, on the north side of the hill, has a particularly



Limestone Quarry of Riverside Portland Cement Co.

rich blue color. The limestone is in two beds separated by quartzite. The strike is northeast and the dip is 25° SE. On the west side of the mountain the limestone is underlain by mica diorite, an intrusion of which has caused the local uplift and tilted the sedimentaries toward the southeast. Above the limestone is micaceous quartzite, in turn overlain by another bed of limestone.

This limestone was formerly quarried by the Blue Sky Marble and Onyx Company,⁹ of Riverside, some of it being used for building purposes in Riverside and Los Angeles, and some for ornamental purposes in San Francisco. There were, also, two kilns at the quarry; the product having been put on the market under the name of "Lily White" lime. About 75,000 barrels of lime were burned at the quarry.

⁹Bull. 38, pp. 75-76.

Analysis of Riverside Blue Marble.¹⁰

Lime	55.85%
Equivalent to lime carbonate	99.73%
Magnesia	0.30%
Iron	Trace

This analysis shows it to be a remarkably pure carbonate of lime.

The mass of igneous rock beneath the limestone on the west is a very fortunate occurrence for the cement company since it supplies the aluminous material needed to complete the mixture. Lithologically the rock is a mica diorite. It is coarse in texture and so far decomposed that it is excavated with an electric shovel.

When this decomposed diorite is pulverized and mixed with the limestone, the raw mixture has the following composition:

Silica	15.18%
Iron oxide and alumina	5.06%
Lime	76.34%
Magnesia	2.90%
Total	99.48%

After burning and grinding, the finished cement gives the following average analysis:

Silica	22.98%
Iron oxide and alumina	8.80%
Lime	63.10%
Magnesia	2.42%
Sulphuric anhydride	1.42%
Total	98.72%

The raw materials are passed through Gates' crushers which reduce them to 3 inches and under, and then are dried separately in rotary driers. They then pass to ball and tube mills for grinding and after mixing are burned in 18 rotary kilns 8 ft. in diameter, 10 measuring 100 ft. in length and 8 measuring 120 ft. From the kilns the clinker passes on conveyors to piles for cooling. In these piles it remains two or three weeks. From these piles it is taken to be ground in ball and tube mills, and thence to a Bates automatic weighing machine for packing. The McCaslen system of conveyors is used throughout.

Riverside Portland Cement Manufacture.

The limestone used is of exceptionally high grade, running 98% pure. Clay materials of the ordinary type of composition, consisting mainly of silica, iron and alumina, are also used. The particular clay material used carries approximately 8% of lime.

These materials are quarried in the usual manner and brought into the mill separately, each being ground so that approximately 40% will pass a 100-mesh screen, and 100% pass a 10-mesh screen, at which

¹⁰Analysis furnished by the Sky Blue Marble and Onyx Co., John A. Wessener, analyst. See Bull. 38, p. 75.

fineness a blend is made of the material, making what is commonly known as the "raw mix."

This material is then ground, from 96% to 97% passing 100-mesh screen before burning. No calcining whatever is done in the drying, simply subjecting the materials to sufficient heat to drive off free moisture. This material is then burned in the usual manner in rotary kilns, being subjected to sufficient heat to combine the two materials



Cement plant of Riverside Portland Cement Co.

thoroughly, forming what is commonly known as clinker, ranging from the size of peas to 2 inches in diameter. It then passes through rotary coolers, where it is sufficiently cooled for regrinding.

At this point it is weighed and 3% of gypsum added, the latter being added to regulate the setting time of the finished product. The clinker is then ground so that 96% to 97% passes a 100-mesh screen, and 80% to 82% passes a 200-mesh screen. It is then conveyed and stored in what is known as cement storage, from which point these materials are drawn and sacked according to the demand, the Bates type of automatic machine being used for packing.

Dust Precipitation.

The dust-laden gases from the kilns pass up through the stacks which are at present capped on top. Gases leave the stacks at a point about 80 feet above the ground, and pass horizontally through dust precipitation apparatus. Each kiln has a separate "treater" and electrical apparatus. The treater consists of a box about 30 feet long on each side of the stack. Each box contains rows of plate electrodes 15 feet long

vertically and one foot apart. Between these rows of plates are placed the discharge electrodes which consist of fine wires hung vertically 1 foot apart, and 6 inches from each plate electrode. As the plates and electrodes are vertical, the gases pass at right angles to the plates and wires. At the end of each treater farthest from the main stack, the gases discharge into a short outlet stack.

Below the plates and wires each treater has hoppers and once each hour the dust is shaken from plates and wires with small air hammers. This operation requires about a minute. The dust falls into the hoppers and then into cross conveyors. It then passes to a main conveyor and out of the building either to the dust packing plant or to storage.

The original installation comprises 10 sets of these treaters, one for each of the original 10 kilns. The volume of gases to be handled averages about 50,000 cu. ft. per minute per kiln and each treater catches 5 to 10 tons of dust per day. The dust precipitation takes place at a voltage of about 50,000. This is a uni-directional discharge produced by rectifying a high voltage (50,000 volt) alternating current by means of a simple mechanical rectifier. Each treater requires about $3\frac{1}{2}$ kilowatts for its operations.

The original installation has been running about two years without depreciation and with an average efficiency of over 95%. A short time ago an additional kiln was installed at the plant and this has been fitted with a slightly different type of treater in which the gases pass through vertical pipes, 1 ft. in diameter, with a discharge wire in the axis of each pipe. In this new kiln the company is now producing cement from the dust caught in the treaters on its original ten stacks. The average potash content of the dust is about 2% and in the new kiln this potash is concentrated so that the average potash content in the dust resulting from the burning of dust is about 20%. A portion of this potash-bearing dust is being sold to fertilizer manufacturers.

CLAYS.

Brick clays, in this county, as elsewhere, occur locally at many points and are not of great commercial importance, but the most prominent member of the nonmetallic group is found in the plastic clay of the Temescal Valley.

PLASTIC CLAYS OF RIVERSIDE COUNTY.

In western Riverside County extending along the Temescal Valley for 10 miles from Elsinore on the southeast to and beyond Corona on the northwest is a zone of plastic clays of superior quality. In many places they resemble the important white, gray, black, red and variegated Cretaceous clays of New Jersey and eastern Pennsylvania, and like the latter, the Temescal clays vary locally in thickness, color and other properties, consisting at different points of white, red, and

mottled plastic clay, and gray and black flint fire clay. The extent and thickness of these clays, together with the great plasticity of some and the highly refractory qualities of others, give them much importance and these deposits will grow in commercial prominence as the population of southern California increases, and transportation lines are farther developed. Many openings have been made in these beds at different points from which, during a number of years, clay has been taken for the factories at Elsinore, Corona and Los Angeles.

GEOLOGY OF THE TEMESCAL VALLEY CLAYS.

The valley in which these extensive deposits lie was in Tertiary time an arm of the sea opening northward into the valley of western San Bernardino County, and extending southerly to Temecula. Its width is from one to two miles, but the depth is unknown, as, at the terracotta works near Alberhill a drill hole was sunk over 600 feet without reaching the bottom of the basin.

These clays are of a great variety of colors. They are in various conditions of consolidation, and some are chalky in appearance, and there are thick beds of loosely cemented argillaceous quartz sand. These deposits dip westward from the Temescal Range, and instead of also dipping away from the Santa Ana Mountains, at many points they dip west into the latter range. Three miles south of Corona the dip of the beds is 5° to 10° SW. and, as the Santa Ana Mountains are approached, the dip increases, and at distance of a fourth of a mile up to the metamorphics, it varies from 45° to vertical. At the California Clay Manufacturing Company workings the dip is eastward.

Poorly preserved fossils are found in places. Near the southeastern corner of the Hoag Ranch is a hill with hardened concretionary sandstone outcropping around it. Nearly every portion of this contains fragments of bones supposed to be cetacean.¹¹ Two miles south of the old Temescal post office is an outcrop of soft sandstone, dipping 30° southwest and carrying Miocene fossils.¹²

In the region between Corona and Alberhill, at various points, the clay deposits are overlain by debris of disintegrated granite, varying from a few inches to many feet in thickness, but south of Elsinore the Tertiary deposits are now covered by Quaternary gravels.

CLAY AND CLAY INDUSTRIES.¹³

Clay can not accurately be defined in technical terms and yet the name has been adopted into technical literature as a convenient word. It is a substance varying so widely in its chemical and physical properties, that it is difficult to frame a definition that will include them all.

¹¹H. W. Fairbanks, Report XI, p. 111.

¹²H. W. Fairbanks, Report XI, p. 110.

¹³R. IX, pp. 240-261—Pottery. Mrs. Linna Ireland; pp. 287-308. Clays, W. D. Johnston; and Bull. 38, p. 190 *et seq.* For convenience much of the discussion on Clays is abridged from Bull. 38.

It is sometimes defined as an earthy substance composed essentially of the mineral kaolin, a hydrous silicate of alumina. But it has not been proved that kaolin is the essential base, or that it is always present.

Clay is also described as an earthy substance in which silicates of alumina predominate, thus excluding any large proportion of siliceous sand, calcareous or magnesian matter, and oxides of iron and manganese.

One definition includes in clay "all earthy and stony substances which are or may be used in the manufacture of clay wares."

The report of the U. S. Census Office, "Mines and Quarries," 1902, p. 861, gives the following definition of clay: "Any earthy substance which, if mixed with water and moulded, will retain its shape after drying, and which upon subjection to high temperature loses its plasticity and becomes hard and brittle."

ORIGIN OF CLAYS.

The source of the silicate of alumina, which is an important part of all clays, is found in the aluminous minerals of crystalline rocks, especially in feldspars. In weathering, the alkalis are separated, combine with carbonic or other acids, and are carried away in solution. The alumina and part of the silica frequently combine with water, forming kaolin.

The hydrous silicates of alumina are very stable compounds at ordinary temperatures. The constituent elements may not always combine in the same ratio as in crystalline kaolinite, but they are present in some form and constitute an important part of all clay, shale and slate deposits, and hence form a very material portion of the surface rocks of the earth.

When hydrous silicate of alumina or similar clayey material is segregated and forms a considerable portion of any deposit, the product is called clay, but it occurs also in large quantities mixed with other materials in other rocks, as with sand in sandstone, with gravel in conglomerates, and with carbonate of lime in limestone. When clayey limestones disintegrate by the action of carbonated waters dissolving the calcium carbonate and carrying it away in solution, the insoluble aluminum silicate is left behind as residual clay. Disintegration of sandstones and shales forms a mixture of clay and sand, which, when carried away by rain and streams is frequently separated into sand and clay deposits.

Thus clays may be divided, on the basis of origin, into residual clays, or those occurring in the place of the original rocks from which they have been formed, and transported clays, which have been deposited by water which has transported them from their original position.

Glacial clay (boulder clay or till) is a special class of transported clay in which the agent has been ice. Besides the clay of disintegration

that has been picked up by the glacier, glacial clay consists in part of a finely-ground fresh-rock material, which was formed by the boulder-shod mass of ice pulverizing the rocks over which it passed.

Chemical Composition.

"Kaolinite, which is the basis of all clay, is a hydrous aluminum silicate (Al_2O_3 , 2SiO_2 , $2\text{H}_2\text{O}$). All clay in its natural state contains impurities, the kind and quantity of which determine its character; from the purest varieties, called kaolin, clays range through all stages of impurity down to a material which contains so little kaolinite that it can not be classified as clay."

"The foreign material of clay is frequently divided into fluxing and nonfluxing constituents, depending upon whether or not they increase the fusibility of the clay. The most common fluxing constituents are lime, magnesia, potash, soda, lithia, iron, and manganese. The fusibility of the clay is affected by the condition of the fluxing constituents as well as by their quantity. For instance, a small percentage of iron oxide, finely divided and intimately diffused through the clay will prove a more active flux than twice the amount scattered through it in coarse grains. The common nonfluxing constituents are silica and organic matter, but this statement is not wholly exact, as silica may slightly increase the fusibility. These constituents may be present in quite a variety of forms.

Physical Properties of Clays.

Some of the qualities which make clay valuable are: (1) plasticity and mobility when wet; (2) retention of the molded form when dry; and (3) hardness and durability when burned. Plasticity when wet is a property common to all clays but flint fire clay.¹⁴

Plasticity is a result of the microscopic texture of clay. (See Report IX, California State Mining Bureau, p. 287). Kaolinite, which is formed *in situ*, and composed of crystalline scales, is only slightly, if at all, plastic, while kaolin, which has been transported, and is composed of infinitesimal globular particles, makes a highly plastic clay. Flint clay becomes plastic when finely ground.

In drying, clay loses part of its interstitial water, and in burning, loses the remainder and part of the water of crystallization. The hardening of clay from the action of high temperature is permanent, the nature of the material is changed, and it no longer becomes plastic on the addition of water.

Shrinkage. All clays that are molded wet, shrink on drying (air shrinkage) and undergo further shrinkage when burned (fire shrinkage). This shrinkage is due, in great part to loss of water, which

¹⁴Possibly some persons would add Fuller's Earth to the exceptions, but it need not at all be classified with the clays.

exists in clay as water of crystallization, and as a film around the particles or inclosed between them.

Air shrinkage is largely due to the loss of water of the second class, as indicated by the fact that the shrinkage is from 2% to 10%, while it takes from 14% to 35% to make the clay plastic. The difference indicates, in a general way, the volume of the interstices.

Clays differ greatly in the amount of their shrinkage. In general, the more plastic and purely argillaceous clays, shrink more than sandy, siliceous ones. Hence, if the brickmaker has a clay that is too "fat," he adds sand to it. Clay that has once been burned undergoes no further shrinkage on subsequent burning, hence burned clay is frequently used as a "grog" to lessen shrinkage, especially in refractory products, where sand might lower the fusing point.

Fire shrinkage is caused, in part at least, by the loss of water of crystallization along with the remaining interstitial water. It is also affected by the amount of organic or other volatile matter present. Moreover, some substances which expand on heating, if present in the clay, may more than counterbalance the shrinkage of the argillaceous part.

It is important to know the shrinkage of the clay that is to be used for products of definite dimensions, so that the mold may be made of the proper size. Laboratory tests made on a large number of different kinds of clay gave the following results, each being the average of several specimens of that kind:

Laboratory Test on Shrinkage.¹⁵

	Air average shrinkage,	Fire shrinkage, average
Flint fire clay.....	3.5%	9.9%
Kaolin	5.0%	8.8%
Potter's clay	7.0%	5.4%
Brick	5.5%	4.5%
Shales	6.0%	4.6%
Gumbo	9.0%	1.5%

Fusibility of clays. The clay manufacturer must necessarily know the fusing temperature of the clay he is using, in order that he may not injure or destroy his ware by overburning or underburning. The term "fusibility" applied to clays has a significance different from that of the same word applied to metals. When clay is heated beyond a red heat, it shrinks and becomes close-grained and harder. It finally reaches a point where shrinkage ceases and it becomes very hard and strong, and the individual grains are no longer recognized. This is called complete vitrification, although the clay still retains its form and shape.

¹⁵Bull. 38, p. 193.

If the temperature is further increased, the clay begins to warp and sag, and blister, and becomes scoriaceous, which stage may be called scoriaceous vitrification. A further increase in temperature may produce a complete vitrification to a molten stage, from which it cools to a hard, glassy, rock-like slag. The temperature at which the various stages of vitrification occur are different for different clays, and are largely functions of the chemical and physical composition of the clay.

Clays which resist vitrification at high temperature are called fire clays or refractory clays, but the line of separation between refractory and nonrefractory clays is an arbitrary one. (See Fire Clays.)

Color. Clays may be white, black, red, yellow, brown, blue, or variegated. White clays are free from metallic oxides, and frequently occur among the purest forms of kaolin. Black clays are generally colored by carbonaceous material diffused through them, and are frequently made white by burning. The yellow, brown, red and frequently the blue colors are due to iron in some form. In yellow clay the iron is in the form of the hydrous sesqui oxide, the common bog ore; in the red, the color is due to anhydrous sesqui oxide, or hematite; the blue color may be caused in part by iron carbonate, silicate, or sulphide, and sometimes wholly or in part by organic matter.

The color of clays after burning is frequently different from that before burning. They may be divided into those which burn white, buff and red.

The color of the burned clay is influenced not only by the amount of iron in the clay, but also by the physical and chemical condition of the iron, the other elements associated with the iron, the temperature and length of time in burning, and the character of the gases in the kiln. The color of the burned product is thus very largely influenced by the skill of the burner.

In the finer grades of ware, the desired color or colors are obtained by mixing the proper pigments. Almost any desired color or shade of color, except white, can be obtained in this way. For white wares, clay free from metallic oxides is necessary.

POTTER'S CLAY.¹⁶

Potter's clay is a term rather loosely used. The usual idea conveyed by the term, probably, is that of a smooth, plastic clay, too fusible for highly refractory purposes and containing less iron than ordinary brick clay. It is adapted to the manufacture of stoneware, earthenware, terra cotta, and sewer pipe. Wares manufactured from potter's clay are usually light buff in color, and when burned to incipient vitrification are strong and slightly porous, requiring a glaze to

¹⁶Bull. 38, pp. 196-197.

render them impervious to liquids. The stoneware glazes are commonly either salt glaze or one formed from slip clay. Much stoneware is made with a brown slip glaze on the inside, and a blue-gray salt glaze on the outside.

The requisites of a good stoneware clay are: (1) It should be extremely plastic, so that it may be easily moulded and turned into the thin walls of the vessels required and yet retain its shape without injury. To mold readily, it should be high in clay base, that is, a "fat" clay; (2) It should be low in iron, as a light-colored ware is desirable; (3) It should be free from coarse sand or other coarse material. It is frequently necessary to remove such material by a process of washing, in which the coarse materials are separated by gravity. The washing process will remove the iron if it should be present in crystals or lumps, the condition in which it causes the greatest injury; (4) It should be fusible enough to vitrify at a moderate temperature, less than 2000° F. If the vitrifying point should be too high, the burning would be too expensive; (5) The clay should have a range of at least 200°, and better 300°, between incipient and complete vitrification, as it is not easy to control the temperature of the furnace within narrower limits, and all the ware in the kiln would pass the stage of incipient vitrification, but should stop short of complete vitrification. If it has not reached the first stage it will be soft, porous, and lacking in strength, and if completely vitrified it would be glassy and brittle, and probably be out of shape; (6) It should be capable of drying at a moderate speed without checking or cracking, otherwise there will be increased storage and drying room required, increased stock, and therefore more capital and greater expense; (7) It should be free from salts that are liable to cause blisters in burning.

Yellow or Rockingham Ware is a class of pottery differing from stoneware in the manner in which it is burned. In stoneware, the burning is complete in one operation, while yellow ware is first burned in the biscuit kiln to form the body, and then burned again to develop the glaze. A less refractory clay may be used in the yellow ware but, since the glazes fuse at lower temperatures, the same clay may be used for either stoneware or yellow ware.

Earthenware is the lowest form of pottery, and can be made with proper precautions from almost any common yellow clay. It is softer and more porous than stoneware or yellow ware.

SLIP CLAY.

Slip clay is a variety that runs low in fusibility, and is used in forming the glaze on stoneware and earthenware. The following analysis of a slip clay shows the composition of one of the best known and most widely used clays of this class in the United States:

Albany Slip Clay.

	Per cent
Silica (SiO_2)	56.75
Alumina (Al_2O_3)	15.47
Iron (Fe_2O_3)	5.73
Lime (CaO)	5.78
Magnesia (MgO)	3.32
Alkalies	3.25
Water	5.87

Much of the slip clay used in California is obtained from Albany, N. Y.



Clay pits of Alberhill Coal and Clay Co., at Alberhill.

FIRE CLAY.

Fire clay, as the name signifies, is one that resists high temperatures, and hence is more refractory than the common clays. It has a lower percentage of the fluxing substances, such as alkalies, iron and manganese. It is commonly associated with coal beds or other vegetable deposits and it is thought, in some instances, to owe its qualities to the action of vegetation or vegetable matter which has extracted from the clay the fluxing constituents, such as iron alkalies and alkaline earths.

There are two classes of fire clays: The soft or plastic, and the hard or flint. The latter occurs in hard rock masses, does not slake in water,

and is not plastic in its natural condition. Fire clays are used for making fire bricks, stove and furnace linings, gas retorts, glass pots and for other refractory purposes. They are also used for making high-grade building bricks, and some low-grade fire clays are used for making paving bricks.

List of Los Angeles Manufacturers Using Riverside County Clay:

Simons Brick Company, 128 West 3d St., uses Ione (Amador County) clay also.

Pacific Sewer Pipe Company, 825 East 7th St.

Los Angeles Pressed Brick Co., 404 Frost Bldg.; uses Ione (Amador County) clay also.

Independent Sewer Pipe Co., Tropic. Suspended in 1915.

St. Louis Fire Brick and Clay Co., 2464 East. 9th St.

Ramona Tile Co., Van Nuys Bldg.

Consolidated Pacific Cement and Plaster Co., San Fernando Bldg.

Acme Plaster Co.

Inglewood Brick Co., Washington Bldg., also make sand-lime brick.

California China Products Co., National City, San Diego County.



Alberhill Coal and Clay Co., pit at Alberhill.

OPERATING COMPANIES.

The Alberhill Coal and Clay Company, 430 Union Oil Bldg., Los Angeles, ships clay from several openings at Alberhill, the terminus of the railway spur from Elsinore. This company is the largest producer of clay in the Temescal Valley. The holdings are in Secs. 15, 22, and 23, T. 5 S., R. 5 W. At the tippie of the abandoned coal mine is a large

clay pit. The upper portion of the deposit consists of 10 ft. of red and gray variegated clay, underlain by 6' to 8' of a mixed fire clay and granitic sand, and in turn underlain by gray to black clay with thin streaks of coal, and at the base, underlying the coal seams is a bed of blue plastic fire clay, with 3' to 4' exposed.

About half a mile southeast of the pit and about 200 ft. higher on the hill, is another pit, from which the clay is hauled by wagon to the railway. Here, a high-grade fire clay is obtained.

Harrington Clay Pit, in Sec. 35, T. 4 S., R. 6 W., leased to M. W. Findley, president of the Independent Sewer Pipe Company, and by



Clay pit of Alberhill Coal and Clay Co., at Alberhill.

him formerly sublet to the Pacific Sewer Pipe Company, is in the Temescal Cañon, about 10 miles southeast from Corona. It lies on the east side of the valley, about 300 ft. above its floor. A section of the face of the pit shows several varieties of clay, as follows: At the top 2' to 6' of sand and boulders, underlain by from 10' to 20' of red and white mottled plastic clay. Beneath this are 4' to 10' of white plastic refractory clay, and at one end of the quarry is a red clay with pisolitic structure resembling a ferruginous bauxite.

The clay from this pit is hauled in wagons to the Chase railroad spur south of Corona, for shipment to Los Angeles.

Pacific Sewer Pipe Company, 825 E. Seventh street, Los Angeles; E. M. Durant, president; Archibald Douglass, secretary. This company, formed by the consolidation of several others, controls clay beds at Corona and Alberhill and at intermediate points. At present it is shipping clay from Alberhill only. Part of its raw material is bought

from the Alberhill Coal and Clay Company. A little clay is used from Antelope Valley north of Rosamond, Kern County.

This company owns the pit three miles southwest of Corona, formerly owned and operated by Mr. McKnight. It produces a black flint clay,



Clay pit of Alberhill Coal and Clay Co., at Alberhill.

besides some blue refractory clay. This clay lies on the top and south side of a low hill in a bed dipping 35° S., and has been mined by tunneling at the base of the hill. The black flint clay is about 20 ft. thick, overlain by 10 ft. of blue clay and about 20 ft. of reddish plastic clay, capped by coarse, granitic sand. Large quantities of highly refractory clay are obtained here.

This company also owns a large pit in the valley about a mile southwest of the Harrington pit. The clays are similar to those in the latter, but occur in different order. At the surface there is an overburden of from 5' to 25' of sand and boulders. At one side of the pit the sand is underlain by white plastic clay from 15' to 25' thick, underlain by red mottled clay; at the opposite side of the pit the clay rests on red mottled clay, of which a portion has a pisolitic structure. Both the red and white clays are smooth and plastic but, in places, contain diffused quartz grains, which prohibit their use in fine ware, unless the clay be carefully selected, or the coarse particles removed by some system of washing.

This company also operates the clay pit at Alberhill, near Elsinore, formerly owned by W. G. McVicar.

This company controls six manufacturing plants.

No. 1. At Terra Cotta, three miles northwest of Elsinore, formerly owned by the California Fireproof Construction Company, and previously by the Dolbeer Estate of San Francisco. This was used for making



Plant No. 1 of Pacific Sewer Pipe Co., at Terra Cotta.

sewer pipe, earthenware, and hollow bricks, sewer pipe being the chief product, but it is now idle. The clay was procured from Alberhill. On the hillside near the factory are two clay pits from which clay was formerly mined.

No. 2. Half a mile west of Corona, on the south side of the Santa Fe Railway, formerly belonging to the Corona Pressed Brick and Terra Cotta Company. This plant has been dismantled.

No. 3. These works are one mile west of Corona, on the north side of the Santa Fe Railway. Formerly owned by the Pacific Clay Manufacturing Company. Here are made sewer pipe, both salt-glazed and unglazed tiles, flue linings, chimney pipes, fire bricks, conduits for electric wires, and terra cotta. The Acorn brand of fire brick is made here from the refractory clay of the McKnight quarry, previously described. The different kinds of pipe, etc., are made of clay obtained 10 miles

south of Corona. The factory is well equipped with machinery. There are eight round, downdraft kilns in use, heated with oil fuel.

No. 4. At 423 North Avenue 26, Los Angeles. Formerly operated by the Los Angeles Stoneware and Sewer Pipe Company. This is used for stoneware, Terra Cotta flue lining, fire brick, pressed brick, enameled brick, drain-tile, sewer pipe. Here are manufactured all kinds of stoneware, earthenware, fire brick, vitrified, salt-glazed sewer and water pipe, from 3" to 36" in diameter; conduits for underground electric wires, Terra Cotta chimney pipes, flue linings, etc.



California Clay Mfg. Co. pits near Alberhill.

The following materials are used at this plant for stoneware: clay from the Alberhill Coal and Clay Company, Alberhill; and kaolin from Rosamond, Antelope Valley, Kern County. For sewer pipe: clay from Alberhill Coal and Clay Company, and local clay from the northeastern part of Los Angeles City. For fire brick: fire clay from Alberhill Coal and Clay Company. For flower pots: local clay. For glazing: slip clay from Albany, N. Y. and from Michigan; also, imported feldspar, flint, china clay, and English ball clay.

The clay, duly mixed, according to the product to be manufactured, is passed through a dry-pan crusher, then washed, blunged and pressed through a press filter. The fire brick material passes through a pug-mill, a Giant auger, 12-brick wire cutter, and an Eagle represser. The sewer

pipe material passes through a wet-pan crusher, and two presses, according to the dimensions of the pipes, one making those from 3" to 16" in diameter, and the other those from 18" to 36" in diameter. The pottery material goes to the pottery pug-mill, where it is brought to the required plasticity. The green products are dried in large rooms, slightly heated by the exhaust from the kilns. The time required for drying depends upon the weather: in summer from 8 to 10 days are sufficient.

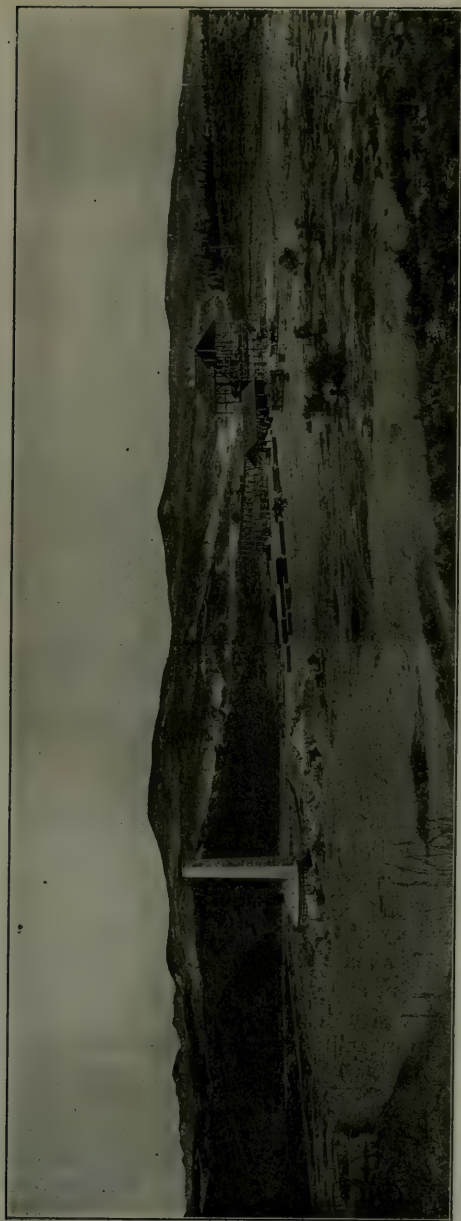


California Clay Manufacturing Co. pit near Alberhill.

The plant has seven downdraft kilns, using oil as fuel: three of 30 ft. diameter; one of 25 ft. diameter; two of 20 ft. diameter; and one of 12 ft. diameter. Power is furnished by a 250 h.p. boiler, using oil as fuel, and a 200 h.p. engine.

No. 5. McKinley and Slauson avenues, Los Angeles. Formerly owned by the California Clay Manufacturing Company. Used for sewer pipe and vitrified conduits. The works are equipped with Brewer wet-mud brick machines, and a Berg press for dry-pressed brick, each with a daily capacity of about 20,000 bricks; a Barber pipe press, and 8 downdraft kilns, varying from 16' to 30' in diameter, using oil as fuel. About 30 men are employed.

No. 6. At Los Nietos. Used for sewer pipe and drain-tile.



Panoramic view of new works of Los Angeles Pressed Brick Company, at Alberhill, Riverside County. Photo by Gerald A. Waring, July, 1916.

California Clay Manufacturing Co. is working clay pits near Elsinore, analyses of their materials being given below. Alexander Caskey is manager, with offices at 235 South Los Angeles St., Los Angeles.

Analyses of Clays from the Mines of the California Clay Manufacturing Co.

Analysis	No. 20. Color, gray, fuller's earth. per cent	No. 23. Whitish, tile clay. per cent	No. 25. Color, gray, fire clay. per cent	No. 26. Color, white, China clay. per cent	No. 26. Color, white, plastic. per cent	Fire clay, hard and sandy, per cent	Red clay, pipe, per cent
Silica (SiO ₂)	62.14	68.16	61.02	42.54	43.70	54.8	41.30
Alumina (Al ₂ O ₃)	23.84	20.54	21.42	38.48	39.09	37.1	28.10
Iron Oxide (Fe ₂ O ₃)	2.24	1.76	4.00	2.40	2.50	.7	15.00
Titanic Oxide (TiO ₂)	1.00	.70	.20	1.12			
Lime (CaO)	.74	.46	1.68	.22	.40	.6	.60
Magnesia (MgO)	.22	.45	.76	.12	Trace		.09
Alkalies (K,Na) ₂ O	.82	.55	1.02	.70			
Sulphuric Anhydride (SO ₃)	.11		.25				
Ignition loss	9.10	7.62	10.08	14.80	15.10		13.00
	100.21	100.25	100.43	100.38	100.79	93.2	98.08

Analyses by Smith, Emery & Co.

The **Los Angeles Pressed Brick Co.** is (July, 1916) building a new plant for manufacture of clay products at Alberhill.

COAL.

Alberhill Coal and Clay Company shipped some coal from its holdings at Alberhill several years ago. No recent production of the coal. Work confined to the clay pits. See under Clay.

FULLER'S EARTH.

(See California Clay Mfg. Co., under Clays.)

GEMS.

TOURMALINE.

The tourmaline mines of this county were discussed in detail by Dr. Geo. F. Kunz in Bulletin No. 37, pp. 57-58, and from this publication the following descriptions are in part abstracted with added data contributed by Mr. Clarence A. Waring.

"The first discovery of the colored gem tourmaline in the state goes back as far as 1872, when Mr. Henry Hamilton, in June of that year, obtained some very fine and handsome colored tourmalines on the south-east slope of Thomas Mountain, in Riverside County. This was known as the Columbia Mine, and is one of the most northern occurrences in the state."

¹⁷Dr. Kunz also says:

"In 1893, near the crest of the San Jacinto Range, in Riverside County, loose or 'float' crystals of tourmaline were observed, chiefly black, but some finely colored—red, rose, green, blue, etc. ¹⁸In some

¹⁷U. S. Geol. Survey, Min. Res. 1892, p. 12 (reprint).

¹⁸Bull. 37, p. 57.

cases the green crystals were found to have red centers—a type long known from Brazil. Some large crystals were obtained and a number of gems were cut from them. The indications were promptly followed up, and several mining claims were located and worked. One of them, opened near the summit of the range by three prospectors, Messrs. Dwight Whiting, F. M. Speer, and F. H. Jackson, was called the San Jacinto Gem Mine. It was reported that more than a bushel of red and green crystals was found during the first season's operation, one of which measured 8 inches in length and several inches in diameter. This was purchased by Harvard University, with other crystals several inches long and two inches in diameter. One of this size had a dark green basal termination showing a red center on the fracture at the other end of the crystal."

Other very fine specimens are in the American Museum of Natural History in New York.

Dr. Kunz continues, Bull. 37, p. 21:

"Tourmalines have been mined in Riverside County, California, at the California Gem Mine, the San Jacinto Gem Mine, and the Columbia Gem Mine. These claims are situated at the foothills of the San Jacinto Range, overlooking Hemet Valley and the Coahuila Valley, and about 27 miles southeast from the San Jacinto branch of the Santa Fe railroad. The crystals occur in veins from 40' to 50' wide, running nearly north and south through the crystalline rocks of the mountain range. These veins in places consist of pure feldspar, or of feldspar with quartz; in others wholly of mica, and in others of rose quartz and smoky quartz. The tourmalines vary in size from almost micrograins to crystals 4 inches in diameter. They are most plentiful in feldspar, but are found in other portions of the vein, sometimes in pockets and sometimes isolated. The larger crystals generally have a green exterior and are red or pink in the center. Some crystals contain green, red, pink, black, and intermediate colors; others again are of uniform tint—red, pink, blue, or colorless. Associated with the tourmalines are rose-quartz, asteriated quartz, and fluorite, and some of the quartz is penetrated with fine, hair-like crystals of tourmaline, strikingly like the similar occurrence of rutile.

"Associated with the tourmaline from Coahuila have been found yellow beryls, closely resembling those from Sarapulka in the Ural mountains, also, others that are pale green, pink, and colorless. Some of the yellow crystals are finely formed and others show remarkable instances of etched faces, while others are almost as delicate as a darning-needle.

"Elegant specimens were made from some of the large crystals of this type by cutting and polishing sections across the prism, showing the rich green exterior, then a narrow zone of white, and within that

the red central portion—a beautiful contrast of colors, suggesting a slice of watermelon. Some of these were as much as three inches in diameter. A few years later, remarkably fine crystals of colorless tourmaline (achroite) were reported from this locality by Mr. Dwight Whiting.

“There were, at one time, several mines in operation in the San Jacinto district, which gave a valuable output for several years. The one that has been most prominent of late is that known as the **Fano Mine** (formerly the Simmons), discovered and located in 1902, by Mr. Bert Simmons, but now owned by Mr. E. A. Fano, of San Diego. This was in the name of the Fano-Kunzite Tourmaline Mining Company, on the north side of Coahuila Mountain, at an altitude of some 4500 feet, about a mile south of Bautista Creek, 4 miles west of Ramona Indian Reservation, and 3 miles north of Coahuila Indian Reservation. This mine consisted of 4 claims. The nearest post office is Hemet. After some preliminary surface work a tunnel was driven 300 feet from the summit of the hill, to cross-cut the ledge, which was found about 20 feet from the surface. The parties then continued the tunnel until, at a distance of 176 feet, solid blue diorite was reached. The tunnel was then abandoned, and since that time work has been confined to the surface.

“The dike is about 5 feet wide, with a northwest and southeast strike, and dips southwest about 17°. The pegmatite is finely crystallized, and resembles that of the other tourmaline and kunzite mines in San Diego County.

“The output so far has been 25 pounds of kunzite, white; 1 pound of kunzite, pink; and 25 pounds of all classes of tourmaline, mostly blue and green; about 250 pounds of beryl have also been taken out, but only 5% of it available for gem purposes. Two hundred pounds of very fine quartz crystals also have been sold, and about a ton of lepidolite and 30 to 40 pounds of amblygonite; also flake mica has been discovered large enough for commercial purposes.

“There is a spring near the property, on land rented by the owners of the mine; also, plenty of oak timber for mining purposes. Considerable money has been expended here without much result, but for the work actually done on gem pockets, this mine has been a splendid producer.

“Several tourmaline mines were also located by **Mr. Bert Simmons**, north and east of Coahuila, from which some large gems have been obtained.”

Columbia Gem Mine. “This, the oldest tourmaline mine in the state, is on the site of the original discovery of colored tourmaline in this county, made by Mr. Hamilton, in 1872, and was owned by Messrs.

H. C. Gordon, P. E. Johnson, J. C. Connell, and William Dyche, but other parties have claimed it under the name of the April Fool Mine.

"It is on Thomas Mountain near Coahuila, at 5000 feet elevation, about $\frac{1}{2}$ mile northwest of the road leading from Coahuila to the Hemet reservoir, and near the summit of the divide crossed by this road. The property has produced many beautiful gems, but nothing except assessment work has been done on it for many years. The pockets worked, at one time, seem to have been exhausted, and nothing important has recently been found. The pegmatite dikes are of very fine grain, and both sides of the pocket material seem to be of the same character, thus differing from the other gem-bearing dikes of California. There is no water or timber available."

Mr. C. A. Waring contributes the following additional matter on this property:

California Gem Mine: "It is located at the east end of Thomas Mountain, on Nigger Jimmy Hill. Yielded rose quartz and black and green tourmaline. It is said that \$10,000 worth of gems were taken out about 1894. Some pink, green, and dark red tourmaline is said to have been taken out also. It is said that \$300 worth of rose quartz has been taken out recently. The workings consisted of a cut 60' long and 15' deep, with, also, a few scattering prospect holes. The product is reported to have been sold to Messrs. F. A. Marcher, Whiton, Bradley, and Saxon, of Los Angeles."

In November 1914 no other tourmaline mine than this described by Mr. Waring was known in this region. The two others described by Dr. Kunz have been forgotten.

GYPSUM.

This material, the hydrous calcium sulphate, or sulphate of lime, is of much importance in construction since the calcined product, plaster of Paris, is the base of nearly all wall plasters for interior work. It also forms the base of the material known as staff which is so extensively used in the construction of temporary buildings for exposition purposes. Gypsum is also important as a fertilizer in supplying lime and in correcting alkaline soils. In small quantities, it is used in the manufacture of Portland cement to retard its setting.

The principal deposits of gypsum in this county are near Corona and in the eastern desert section. Mr. C. A. Waring reports on the latter as follows:

United States Gypsum Company, 200 Monroe St., Chicago, Ill.; president, S. L. Avery. The gypsum claims of this company are in the southwest corner of T. 3 S., R. 21 E., and the northwest and southeast corners of T. 4 S., R. 21 E., S. B. M. Most of the prospecting has been

carried on in a cove on the south side of the Santa Maria Mountains, 2 miles west of the stage road from Blythe to Blythe Junction. (See upper photo.)

The gypsum beds on the north side of this cove strike N. 50° W., and dip 55° to the north. They are in places 150 ft. thick and consist



Looking N. 50° W., along strike of gypsum deposits, Santa Maria Mountains. Prospects of the United States Gypsum Co. Photo by C. A. Waring.

of fine, white, compact crystals of pure gypsum. The same gypsum beds occur on the south side of the cove with somewhat similar strike but with a southerly dip. The center of the anticline has been faulted and eroded away, leaving the gypsum exposed on either flank. The



Looking eastward along the strike of the gypsum beds, Santa Maria Mountains, from the United States Gypsum Co. prospects shown in view above. The intense folding and faulting of the schists is well exposed in the Big Maria Mountains in the distance. Photo by C. A. Waring.

beds on the southern flank dip into the plains to the southeast. (See lower photo, p. 118.)

The gypsum strata are interbedded with a pale greenish amphibolitic quartzitic schist which weathers to a glossy brown in the desert climate. In places limestone occurs interbedded with the gypsum.

Only prospecting in the nature of cuts and trenches has so far been carried on. Water has been developed in a 585 ft. well on the north side of the mountains in Sec. 19, T. 3 S., R. 21 E.

These gypsum deposits are quite extensive and claims have also been located about 4 miles east of the main U. S. Gypsum deposits. Assessment work has been done on the claims of **Mr. Schellenger**, of the **Riverside Gypsum Company**, and of the **Consolidated Gypsum and Plaster Company**, on the west side of the Little Maria Mountains.

Gypsum is said to occur at the north end of the Palen Mountains, about three miles north of Packard's well.

CORONA DEPOSITS.

In the range of hills west and southwest of Corona are deposits of gypsum, which are somewhat unique, in that they contain besides the calcium sulphate, iron sulphate and some lime. This combination is stated by the orchardists of the district to be particularly valuable, not only as a fertilizer, but also for preventing disease and parasites. For the latter purpose, they dig around the trunk of the tree and put the gypsum near the roots.

Among the larger orchard properties which have their own gypsum deposits are:

El Cerrito Ranch, W. C. McCully, superintendent.

W. H. Jameson Company, J. G. Jameson, manager.

The Natural Fertilizer Co., near Corona, is quarrying gypsum on its property and has a grinding mill in which the mineral is prepared for fertilizing purposes. Ten men are employed.

The Soil Tone Co., W. L. Brown, manager, Corona National Bank Bldg., Corona, is working a gypsum deposit near Corona and shipping a considerable tonnage.

W. C. Barth, Corona, has a gypsum deposit near Corona on which some development work has been done.

George W. Lord, Corona, has been shipping small amounts of gypsum from his deposit near there. He also has ochre suitable for paint.

MAGNESITE.

The chief deposit of this material in Riverside County, is near Winchester, and is carefully described in the U. S. G. S., Bull. 355, pp. 38-39.

This deposit has been opened for commercial use, but without success, for the serpentine matrix dominates to such an extent that it is difficult to separate the magnesite in a state of sufficient purity

from the enclosing rock. At present no use is made of the deposit. It is now controlled by **W. H. Daum**, Equitable Bank Bldg., Los Angeles¹⁹.

Magnesite is important commercially as a source of carbon dioxide gas used in making soda water and similar aerated beverages. It is also used in refractory linings for metallurgical furnaces.

One of the chief uses is in cement for flooring bath-rooms, and similar purposes, for which tile and marble have long been employed.

There is also a limited use of magnesia as a medicine. A very thorough discussion of this subject will be found in *Mineral Resources of the United States*, 1913, Part II, pp. 445-449. See also our Bull. 71, pp. 47-53.

MINERAL SPRINGS.

Among the natural resources of Riverside County, which are of commercial importance, must be reckoned its mineral springs. Their importance lies in their curative properties which attract hundreds of persons to the hotels operated in connection with them. Many of these springs have been known and used for many decades, and their popularity is still noteworthy.²⁰ Some of the most noted of these are on the fault line of Temescal Valley. These are the well known springs of Glen Ivy, Elsinore, and Murrietta. At Elsinore, there were originally several thermal springs containing a small amount of sulphur. Some of these were absorbed in establishing water supply for the city of Elsinore, and there remain those used for their curative properties in connection with the Lakeview Inn and Bundy's Hotel. The analyses of these waters are as follows:

Analyses of Water From Lakeview Inn Hot Springs.

	Original Hot Springs, grains per gallon	White Sulphur Springs, grains per gallon
Total residue by evaporation.....	19.82	19.40
Soluble in water after evaporation.....	13.12	11.83
Insoluble in water after evaporation.....	3.79	6.24
Organic matter and chemically combined water.....	2.91	2.33
The soluble parts consist of—		
Sodium and potassium sulphates.....	7.07	4.00
Sodium chloride (common salt).....	3.38	5.07
Sodium carbonate (sal soda).....	2.67	2.67
The insoluble parts consist of—		
Calcium sulphate (gypsum).....	1.92	2.33
Calcium and magnesium carbonates.....	1.87	2.91
Silica		

¹⁹Since the above was written, W. Wells & Company of New York have taken over the magnesite property between Hemet and Winchester, formerly operated by the Magnesite Refractory Products Co. Shipments of crude magnesite are being made, and construction of a calcining plant begun. E. G. Kleiner, Hemet, is superintendent. (Nov., 1916).

²⁰The most elaborate discussion of this subject thus far issued will be found in U. S. G. S. Water Supply Paper No. 338, by Gerald A. Waring, 1915.

A partial analysis of the waters of *Bundy Hot Springs*, made by the California State University, is as follows:

Partial Analysis of Water From Bundy Hot Springs.

	Grains per U. S. gallon
Sample clear, with taste of sulphuretted hydrogen.	
Sodium and potassium sulphates (Glauber's salt).....	5.02
Sodium chloride (common salt).....	1.64
Sodium carbonate (sal soda).....	6.19
Calcium and magnesium carbonates and calcium sulphate.....	2.04
Silica.....	3.51
Organic matter and chemically combined water.....	.88

Temperature 112° F.

Murrietta Hot Springs. The largest and hottest spring is at Siloam. It will boil an egg in ten minutes. Its waters are 170° F. The analysis of the waters from this spring, by Prof. C. E. Wagner, a chemist of Saxony, Germany, shows the following:

Analysis of Water From Murrietta Hot Springs.

	Constitu- ents per 100,000	Grains per gallon
Sulphate of lime.....	2.14	1.25
Carbonate of lime.....	.69	.40
Carbonate of magnesia.....	Trace	Trace
Iron.....	.52	.30
Soluble silicate.....	6.00	3.50
Chloride of sodium.....	60.10	35.00
Carbonate of sodium.....	2.83	1.65
Hydrogen sulphide and carbonic acid.....	5.15	3.00
	77.43	45.10

Some twelve miles northeast of **Elsinore**, along the western base of the San Jacinto Range, is another fault, along the line of which are several thermal springs, notably Eden Hot Springs, San Jacinto or Relief Hot Springs, and Richey or Soboba Hot Springs. On the eastern base of the same range occur the Palm Springs. All of these springs are well known locally and they are well described in the Water Supply Paper above mentioned, to which, for information about these and other springs in this county the reader is referred.

SALINE DEPOSITS.

Bibl.: Bull. 24, pp. 54, 69, 89, 102, 107, 122-126.

BORAX.

A large portion of the eastern end of Riverside County is occupied by the Colorado Desert, which was once the basin of the ancient lake

which has been named Lake Coahuila.²¹ Salton Sea, in the lowest portion of this basin, is crossed by the boundary line between Riverside and Imperial counties. While no borax is at present being worked in this county, its presence is known to prospectors at a number of places in the Colorado Desert.

Borate of lime has been found in the foothills of the San Bernardino Range northeast of Salton Sea in Riverside County. The borders of this old lake offer a promising field to the prospector for borates, and lime borates should be especially looked for.

Boric acid exists in a number of springs on San Felipe and Carizzo creeks in San Diego County. Dr. Veatch²² in his search for borax in the early days, found boric acid in some quantity in the mud volcanoes and on Carizzo Creek. It has also been discovered in Agua Caliente Springs, on Warner's Ranch, San Diego County. Borax associated with salt and carbonates and sulphides of soda, are found in many of the playa lakes of the Colorado Desert. No locations for borates have been made in this district.

Borax: Native borax or biborate of soda. One of the main sources of borax in the state. Boric acid, 36.6%; soda, 16.2%; water, 47.2%. Color, white, sometimes grayish, bluish or greenish. Hardness, 2 to 2.5. Specific gravity, 1.69 to 1.72. Luster, vitreous to resinous, sometimes earthy. Translucent to opaque. Taste, sweetish alkaline, feeble. Soluble in water. In blowpipe fuses to "borax glass."

POTASH.

(See Riverside Portland Cement Co., under "Cement.")

SALT.

In 1884, the **New Liverpool Salt Company** began work on the salt beds of Salton Sea, producing some 1500 tons.²³ From that time progress was rapid until the submergence of the salt beds in 1903 by the inundation of the basin, when the company stopped work. Prior to the inundation, the basin was being constantly supplied by numerous springs in the adjacent foothills, the water from which flowed into the basin and quickly evaporated, leaving a deposit of pure salt varying from 10 to 20 inches in thickness.

Borings made at Salton give the following section:²⁴

1. Salt crust	10 to 20 inches
2. Mud	6 inches
3. Crust of chlorides of sodium and magnesium.....	7 inches
4. Black ooze containing 50% of water and carrying chlorides and carbonates of sodium and magnesium.....	22 feet
5. Hard clay with a few streaks of cement.....	275 feet 5 inches
Total	300 feet

²¹See Wm. P. Blake, Pac. R. R. Reports, Vol. V.

²²Bull. 24, p. 55.

²³Bull. 24, "Saline Deposits of California," by Gilbert E. Bailey, pp. 122-126.

²⁴Op. cit., p. 126.

Published analyses of the natural crusts from Salton show that the salt was very pure, as follows:

Sodium chloride	91.68	97.76
Sodium sulphate	.68	.70
Calcium sulphate	.77	.38
Magnesium sulphate	3.12	
Water	.75	.96
Insoluble		.20
	100.00	100.00

This salt remained dry in any ordinary atmosphere, and was free from organic matter.

The salt was loosened by cable plows, that cut, in the salt, furrows 8 ft. wide and 6 inches deep, each plow harvesting over 700 tons of pure salt per day. On a moveable railroad track the salt was conveyed to the works.

The workmen were Indians of the Coahuila tribe, large, well developed men, not affected by the dazzling sunlight, and able to work 10 hours a day with the thermometer registering 150° in the sun. As solar heat alone was necessary at this locality, the mill plant consisted only of machinery for grinding and bagging the salt for shipment.

As described by Professor Bailey, the sight of the salt works was an interesting one, for thousands of tons were piled up in heaps like snow drifts, and a large force of men was busy preparing and packing for market, salt of the various grades.

One observer has said:²⁵ "As one approaches the Salton Sea, it looks like an immense crystal lake, and the houses and sheds of the salt works appear suspended in the air, in mirage. As far as the eye can see the white and dazzling field of salt extends towards the horizon."

STONE INDUSTRY.

BUILDING STONE.

That there is a great wealth of valuable stone in California has been known for years. It is equally well known that much of it is undeveloped, a considerable portion of the building and ornamental stone used in this state being imported from other states and from Europe.

Uses of Stone.

Stone is used in substructures very extensively. Wood, concrete, brick, and iron are frequently used as a substitute in superstructures, but where first cost can be subordinated to architectural effect, stone will, in most cases, be used.

For funeral monuments there is no satisfactory substitute for stone, and for this purpose it is often shipped long distances, in order to get

²⁵Bull. 24, p. 124.

one that has an established reputation. Many of the monuments in this state are of stone from New England, Indiana, Georgia, or Europe, and often a large part of the cost of the monument is in railroad and water freight.

Some other uses of stone are in the construction of breakwaters, bridge abutments, culverts, curbing, fences, flagstones, hitching posts, macadamizing, paving blocks, piers, retaining walls, reservoirs, sewers, sluiceways, etc.

Classification of Building Stones.

Rocks are commonly divided into two, sometimes three, great classes: the unstratified, or igneous; and the stratified, or sedimentary.

The first class may be subdivided into the granitic or crystalline rocks, and the volcanic or partially crystalline rocks. The granitic class includes granite, syenite, etc., the volcanic class includes basalt, trachyte, tuff, etc.

The sedimentary rocks include those formed in water, such as sandstone, limestone, etc.

The third class includes the metamorphosed forms of the other two classes. They may be formed from the igneous rocks, as gneiss, some of the schists, serpentine, and talc; or from the sedimentary rocks, such as marble, which is a metamorphosed limestone; quartzite, which is a metamorphosed sandstone; or slate, which is a metamorphosed clay or shale.

GRANITE.

This stone is widely distributed over Riverside County. It has been quarried on a large scale at Casa Blanca for rubble used in the San Pedro breakwater, and for building and ornamental purposes at Corona, Riverside, and Temecula. At Porphyry and Riverside it has been quarried for broken stone. The Casa Blanca quarries have long been idle.

Besides its use for paving, the Corona granite is used to some extent for building stone, and in considerable quantities for monuments in Los Angeles, Riverside and other places in southern California.

The monument dealers in southern California nearly all speak highly of the Corona granite for monuments, thus giving it a reputation in that field. Its nearness to Los Angeles and Riverside also favors the use of this stone for "Belgian" (paving) blocks.

Corona. East of Corona, one mile north of the Santa Fe Railway, in Sec. 16, T. 3 S., R. 6 W., are several productive granite quarries. A number of rounded hills or buttes occur at this place, over the tops and slopes of which the granite outcrops in rounded ledges in the midst of a multitude of large rounded boulders. Many of the boulders, as well as the projecting ledges, have a smooth, hard, firm surface. Some of them have been polished by wind carrying dust, which has worn away

the disintegrated surface as fast as it has been formed. A large part of the granite has been quarried here from the boulders, as these are more easily worked into dimension stone than the massive bedrock. The boulders are especially available for making Belgian paving blocks, which are produced here in large numbers.

Sierra Grande Quarries. M. J. Mayer, lessee. Sec. 16, T. 3 S., R. 6 W., S. B. M. The quarry is in the low foothills, close to the track of the Santa Fe Railway, near Porphyry Station, about 2 miles east of Corona. Here are made large numbers of Belgian blocks for Los Angeles streets; also, considerable granite is shipped to monument dealers in different towns. Mr. Mayer in several places is working the outcropping granite boulders into paving blocks. Under the microscope the granite from Mayer's quarry at Corona is seen to consist of orthoclase feldspar, with a little microcline and albite, quartz, biotite, and muscovite.

The stone from all the quarries is hauled by wagon to the railroad at Hammer switch, about a mile east of Porphyry station.

Corona Rock Company, 516-17 Pacific Electric Building, Los Angeles. The quarry is in Secs. 8 and 17, T. 3 S., R. 6 W., S. B. M. This is a contracting company, using large quantities of building granite, as well as paving blocks, and broken stone for ballast and concrete. Besides the granite quarries north of Hammer switch, this company operates a large quarry at Porphyry Station. The stone is used for concrete, macadam, and railway ballast.

Bly Bros. & McGilliard Stone Co., 678 S. Utah street, Los Angeles. This firm operates two quarries: One in the NW. $\frac{1}{4}$ of Sec. 1, T. 2 S., R. 6 W.; the other in the SE. $\frac{1}{4}$ of the same section. These are in the Jurupa Mountains, which are formed by a granite intrusion.

These quarries produce a large quantity of fine granite used for building purposes in Los Angeles and vicinity. This firm has in Los Angeles one of the best equipped stone yards for handling and dressing stone that there is in southern California. There are saw gangs for sawing stone, as they handle consider sandstone and marble in their contracts. They have stone planers, steam drills, pneumatic drills, and surface tools. There is always a large force of stonecutters, as much of the cutting and finishing is necessarily done by hand. The annual production is 120 carloads (40 tons) dimension stone (5% of this is used for monuments), and 1200 carloads of riprap. Twenty men are employed at the quarry, and 20 men at the yard.

Lane Bros. Monument dealers, 833 $\frac{1}{2}$ S. Figueroa St., Los Angeles, Cal. This firm formerly worked a granite quarry 3 miles east of Corona, loading at Alvord Station on the Santa Fe Railway. This quarry is now idle, and the stone used is purchased from various

quarries. This firm operates a stone cutting yard on Santa Fe avenue, Los Angeles.

Elsinore. Near this town there are two granite quarries which have produced paving blocks in moderate quantities. One is operated by **P. H. Coogan** in Sec. 2, T. 5 S., R. 4 W. The product is chiefly derived from surface boulders; the rock is a gray diorite. The other quarry is controlled by **Connolly Bros.** and is now idle.

Temecula. Two granite quarries have long been worked about two miles south of this place. They have lately been operated by **M. Machado** and **Joseph Winkles**, but were formerly worked by other persons.²⁶

Perris. Between this place and Elsinore are some quarries in diorite controlled by **La Borde Bros.** of Perris.

CRUSHED ROCK.

Temescal Rock Quarry. The quarry is owned by the Temescal Rock Company; office, 603 Central Building, Los Angeles; A. B. Filch, president; H. S. Cook, secretary. The company has about 200 acres of mountain land lying in Sec. 4, T. 4 S., R. 6 W., S. B. M. The quarry is located in Temescal Cañon, 4 miles southeast of Corona. The material that is being crushed is a rhyolitic porphyry and is very hard and sharp. The mountain side where the rock is being quarried slopes steeply and has an elevation of 1000 to 1200 feet above the cañon.

The company has nearly four miles of its own tracks which connect through the cañon with the main line of the Santa Fe Railroad. The plant has a capacity of 1500 to 2000 tons of crushed rock products per day. Besides crushed rock products, an incline tramway has been installed to load massive rock material up to 10 tons in weight, for riprap and sea wall construction.

The quarry extends along the mountain side south of the head of the crushing plant, this quarry floor being 180 feet above the floor of the cañon. It is so arranged that while one end of the quarry is being drilled and blasted, the broken rock on the other end is being loaded into cars and hauled to the crusher. A Marion steam shovel, model 100, loads the broken rock into all-steel dump quarry cars, which have a capacity of 8 tons. The drilling is done by two Star drills, by means of which a line of holes are drilled from a bench and then blasted at one round. Trojan powder is used in the blasting operations. The quarry dump cars are operated by electric motors, receiving the current from a third rail. By a system of levers in a tower over crusher in the crushing plant, operated by one man, an empty car is sent to the steam shovel, when loaded brought back and spotted at

²⁶Bull. 38, pp. 42-47.

chute before large crusher. By means of another lever controlled by the same operator, the load is dumped into a Blake Jaw type of crusher, size 84"x66", and capable of handling a rock 5'x6'x10'. The crusher is driven by 300 h. p. motor. The capacity of this crusher is rated at 600 tons per hour.

The material from this crusher will pass through a 10" ring. The product from the crusher passes through revolving screen (5' in diameter by 12' in length), where the fine dirt material is screened out. The over-size runs down into a No. 9 McCully gyratory crusher and is reduced to 3½" maximum pieces. This crusher is driven by 150 h. p. motor. The material is then conveyed by belt conveyor to two revolving screens (size 5' in diameter by 12' in length) which take out all rock more than two inches in diameter. The over-size material is conveyed to two 48" Symons Disk crushers, where it is reduced to 2" or less. The finished product is carried by means of a belt conveyor from the scalping screens and disk crushers to a sizing screen over storage bins, where it is separated into five different sized products. Those sizes of smallest volume are conveyed by chutes direct into the bins nearest the screen, and those of larger volume are carried by shuttle belt conveyors to bins farther away.

The storage bins have a capacity of 5000 tons of crushed rock. Supplies and material are hoisted from the main railroad tracks over a standard gauge track to the quarry floor by means of 75 h. p. Lidgerwood electric hoist. Another 50 h. p. Lidgerwood electric hoist operates cars over incline to load riprap material.

The following new concern was beginning operations in May, 1915:

B. R. Davison Construction Co. of Monrovia, opening up a quarry near Banning to supply crushed rock for highway work between Banning and Palm Springs.

Riverside Portland Cement Co. (See also page 95), in addition to its output of limestone quarried for use in the cement plant, also offers for sale the crushed crystalline limestone for use in concrete and road work.

SAND.

Sand for building is necessarily in demand at every city, town and settlement, where building operations are conducted. The material occurs abundantly in all stream belts or washes, and needs only an inexpensive treatment by screening to prepare it for use. The only substantial plant observed in Riverside County was 1½ miles east of

Whitewater Station on the Southern Pacific Railroad. From this point sand and gravel are shipped to El Centro and other cities.

This plant is controlled and operated by **M. R. Kane** of Snow Creek post office.

The following persons reported in 1914 the production of sand and gravel from local sources:

J. F. Atkins, 1393 W. 6th St., Riverside.

F. S. Ramsey, 1159 11th St., Riverside.

M. I. Wheeler, 245 Colton Ave., Riverside.

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1892, p. 12;

Water Supply Paper, 338, pp. 387 *et al.*

PART V

The Counties of

Monterey, San Benito,
San Luis Obispo, Santa Barbara,
Ventura

By WALTER W. BRADLEY, EMILE HUGUENIN, C. A. LOGAN,
CLARENCE A. WARING, Field Assistants

PREFACE.

The group of counties presented in the chapters herewith, embrace the southern portion of the Coast Range Mountains, and, with the exception of San Benito County, lie along the coast extending southerly from Monterey Bay to 34 deg. north latitude. This district is characterized by a delightful and equable climate which with, its attractive surroundings has resulted in the establishment of numerous resorts, both along the coast and at several of the larger groups of mineral springs. This area includes several of the important oil fields of California, in the southern portion; and in the northern, numerous quick-silver mines of which the New Idria is now the greatest producer in California, as well as of the United States.

The region is traversed throughout its length by the Southern Pacific Railroad, and for most part is readily accessible.

This report represents the result of several months' field work by the several authors in their various areas during the late falls of 1914 and 1915. We have listed as far as possible all mineral resources, both developed and undeveloped.

Acknowledgement is here made of assistance rendered by the various owners and operatives of properties, both during the field work and in the subsequent preparation of this report.

MONTEREY COUNTY.

By CLARENCE A. WARING and WALTER W. BRADLEY, Field Assistants.

Field Work in September and November, 1914.

INTRODUCTION.

Situated as it is, Monterey County offers inducements which have only partially been realized. Extending from the Pajaro River to the Sixth Standard Parallel south, with an excellent bay, and a railroad the full length of the Salinas River Valley, the county has little to stand in the way of development. The more fertile valley lands of the Salinas, San Lorenzo, San Antonio and Nacimiento rivers are practically all held as large "ranchos" which would yield enormous revenue were they subdivided and subjected to intensive cultivation.

The mineral resources have been little more than prospected, and within its boundaries lie mineral deposits which will contribute enormously to the future wealth of the state.

DESCRIPTION.

Location.

Monterey County borders the central coast of California and is separated from Santa Cruz County, to the north, by the Pajaro River. It adjoins San Luis Obispo County to the south, while to the east it is bordered by San Benito, Fresno, and Kings counties.

Topography.

The principal topographic features of Monterey County are the great central Salinas Valley drainage basin, paralleling the coast and emptying into Monterey Bay; the Santa Lucia Range along the western coast; and the southwestern slope of the Diablo Range on the eastern border.

Geology.

The geology of most of Monterey County is mapped and described in our Bulletin No. 69, on the Petroleum Industry of California. The Santa Lucia Range has a core of granitic rock. This is exposed in Santa Lucia Peak at an elevation of 5967 feet, and throughout the territory between Carmel River and Sur River, either along the coast or in the river cuts. Limestone and gneiss overlie the granite in places and make up Pico Blanco (Photo No. 1), Ventana Cone (Photo No. 2), Marble Peak (Photo No. 3), Twin Peak and Cone Peak (Photo No. 4). Most of the area from Mill Creek southward to Three Peaks and bounded on the northeast by Nacimiento River is made up of Franciscan sandstone and shale with intrusions of serpentine. It is in the region of these serpentine intrusions, in the later intrusive acid

dikes, that the important mineral deposits of the Los Burros district are found. There is evidence of much faulting and the precipitous coast (see Photo No. 4) follows a fault line. Monterey sandstone and conglomerate flank the mountains on the southwest side of Nacimientito River and dip towards the valley. Most of the older sediments exposed east of the Nacimientito consist of Monterey shale, which is considerably folded east of Jolon.

Along the coast, resting unconformably on the granite and Franciscan rocks, are raised beach deposits. The settlement at Gorda (see Photo No. 5) is located on the more recent of these terraces. This terrace is noticeable in Willow Creek, one-half mile back from its mouth and also along the coast north of Gorda. These terraces are important in their relation to placer gold. It is thought that the placer deposits near Jolon originated in a similar manner.

MINERAL RESOURCES.

Embracing an area of 3330 square miles and supporting a population of 24,146 (census of 1910), this stock-raising and agricultural county produced twelve mineral substances in 1913, valued at \$178,679.

The production table, opposite, shows the total recorded output and value of the various mineral resources since 1893. The table does not show the output of single companies which produced brick, copper, coal, feldspar, fuller's earth, petroleum, quicksilver, and sandstone.

ASPHALTUM.

Deposits of asphaltum occur in three districts in Monterey County. In the region southwest of Bradley, near the Nacimientito River, sandstone impregnated with oil is exposed and has been quarried for use on the roads and bridges about King City.

East of Parkfield at the foot of Table Mountain and on the west side of Little Cholame Creek oil-impregnated rocks are exposed which have been a stimulus to oil prospecting.

The **Nylar** asphalt quarry two miles west of Lonoak could still furnish considerable road material but has not been worked recently.

For further information concerning these deposits the reader is referred to Bulletin No. 69, on the Petroleum Industry of California.

CLAY.

The **Mineral Earths Supply Company**, J. C. Jens, 1112 Anza St., San Francisco, owner, shipped a few thousand tons of crude clay, for pottery use, from their pit near Chualar.

MONTEREY COUNTY—Table of Mineral Production.

...s Monterey, San Luis Obispo and Santa Cruz counties

Architects: Los Angeles and San Francisco offices.

²Includes cont. telephone

resistant earth, quicksilver, silica,

⁴See unapportioned:

COAL.

The **Monterey Coal Co.**, or **Pacific Coal and Clay Co.**, did considerable prospecting on a bed of lignite in Priest Valley a few years ago. The coal is of Upper Miocene age and is overlain by the Etchegoin formation. It is of lower grade than either that at the Stone Cañon mine or the Trafton mine in San Benito county.

Bibl.: Rept. XII, Cal. State Min., 1894, pp. 59-60; U. S. Geol. Surv. Bull., 581-D, 1914, pp. 158-160.

The mine of the **Stone Cañon Consolidated Coal Company** is located near the center of Sec. 14, T. 22 S., R. 13 E., M.D.M., at an elevation of 2748 feet. E. W. Mason of San Francisco, secretary.

The deposit consists of an 18-foot bed of a good grade of lignite dipping 45° N. and is overlain by Monterey sandstone. It contains no pyrite, but some sulphur, and is good for steaming purposes. The bed flattens out to about a 20° dip on the 200-foot level.

The deposit is opened up by a two-compartment incline shaft. When visited in December, 1913, one of the compartments was being used. The plant is fitted with eight 250 h.p. steam boilers which run three 250 h.p. electric generators. All hauling and lighting is done by electricity. Air drills are used and telephones are installed at each level. A new heavily timbered two-compartment shaft has been started about 300 feet east of the old one. Water for the boilers was pumped from the mine and treated with lime and soda to get rid of the sulphur.

The coal was shipped by a 20-mile spur track to McKay, on the Southern Pacific Railroad three miles north of San Miguel. The mine is reported to have ceased operating since the heavy January floods of 1914 washed out the spur tracks.

An analysis of Stone Cañon coal, as made by M. R. Campbell of the U. S. Geological Survey, and published in U. S. G. S. Bull 431, p. 245, follows:

Air Drying Loss 2.2.

	Form of analysis			
	As received	Air dried	Dry coal	Pure coal
Proximate—				
Moisture	7.0	4.9		
Volatile matter	46.7	47.7	50.2	53.8
Fixed carbon	40.1	41.0	3.1	46.2
Ash	6.23	6.37	6.69	
Ultimate—				
Sulphur	4.17	4.26	4.48	4.80
Hydrogen	6.28	6.18	5.93	6.35
Carbon	66.01	67.49	70.91	76.03
Nitrogen	1.17	1.20	1.26	1.35
Oxygen	16.14	14.50	10.70	11.47
Heat value—				
Calories	6,915	7,070	7,430	7,965
British thermal units	12,450	12,730	13,380	14,310

Bibl.: Report VIII of Cal. State Min., pp. 403-404, 1888. U. S. Geol. Surv. Bull., 431, pp. 243-8, 1911; Bull. 581, pp. 155-8, 1914; Bull. 285, pp. 223-5, 1906; Bull. 316, pp. 435-8, 1907.

COPPER.

L. E. Bedell of Parkfield, has some copper prospects located in Sec. 21, T. 23 S., R. 15 E., east of Parkfield. The copper occurs as malachite in serpentine.

The Native Copper Co. of Coalinga, Harry Jaynes, secretary, has a group of claims in Sec. 26, T. 23 S., R. 15 E., 7 miles east of Parkfield. Native copper in serpentine is found there. Development work has been by tunnels. Idle the past two years except for assessments.

CHROMITE.

Detached masses of chromite are found in the serpentine on Table Mountain near Parkfield. None has yet been produced commercially.

DIATOMACEOUS EARTH (Kieselguhr).

Jens Deposit. Owned and operated by J. C. Jens, 1112 Anza St., San Francisco, but formerly operated under the name of the Mineral Earths Supply Co. It comprises 120 acres of patented land in Sec. 20, T. 23 S., R. 10 E., 6 miles northwest of Bradley, on the Southern Pacific Railroad. Material from this property has been on the market since 1905. The deposit is a flat-lying bed with an average depth of 240 feet, as shown by bore-holes, and underlaid by a black, bituminous shale. It is uniform in character, and not interstratified with other



Photo No. 1. West face of Pico Blanco, five miles from the west coast of Monterey County. The limestone capping dips to the northeast.



Photo No. 2. View northward, towards the Ventana (Spanish for window; arrow shows position of gap), from Slate's trail at summit of Partington Ridge. These mountains contain considerable limestone.

material. There is practically no overburden. The diatomaceous earth is white in color, and very fine. It averages about 28 pounds per cubic foot, being slightly heavier than the Lompoc earth from Santa Barbara County, on account of containing 5% alumina, which acts as a binder. For this reason it is adapted for use as building blocks for interior fireproof walls. It contains 85% silica. The quarry is worked mainly in the summer time. Jens also reports a small production of fuller's earth from Monterey County.

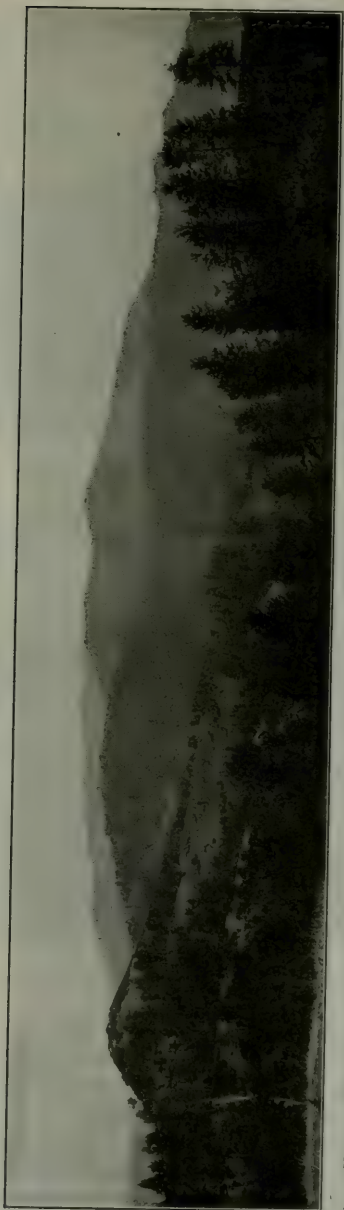


Photo No. 3. View southeastward from Slate's trail, Monterey County. Marble Peak, in the foreground to the left, has an elevation of over 4,000 feet, and is capped with limestone and marble, dipping about 35° NW. It is three miles down Lion Gulch to the coast. The fog in Lion Gulch to the extreme right is at an elevation of 1,500 feet.



Photo No. 4. Looking northward up the coast from Cape San Martin, Monterey County. The steep bluffs are composed of Franciscan sandstone and serpentine. Cone Peak in the distance is made up of limestone and gneiss.



Photo No. 5. Looking west, from an elevation of 1,200 feet, on the main Pine Ridge trail from Gorda. The village of Gorda is situated on a raised beach about one-quarter mile wide.

FELDSPAR.

Jens Quarry. This is a patented property, owned and operated by J. C. Jens, 1112 Anza St., San Francisco, but formerly operated under the name of the Mineral Earths Supply Co. The product has been on the market since 1907; this quarry, with two or three others in Tulare County, being the only producers of feldspar in the state. The

quarry is in Sec. 34, T. 15 S., R. 5 E., 4 miles east of Chualar, on the Southern Pacific Railroad, with which it is connected by a good wagon road. The deposit lies along a contact between limestone and granite. It is a massive orthoclase, 150 feet wide, and can be traced for a mile and a quarter in length. The feldspar is remarkably clean and massive, and of a pale cream color to almost white. The quarry cut is 40 feet deep, and a number of churn drill holes put down in the



Photo No. 6. Jens Feldspar Quarry near Chualar, Monterey County. Showing massive orthoclase feldspar, 150 feet wide. Photo by J. C. Jens.

bottom to a depth of 42 feet show the same character of material below. About 600 tons of the product is shipped yearly to pottery makers. An average of seven or eight men are employed during the summer months.

An analysis of the feldspar, by E. W. Rice, is as follows:

SiO₂—65.66%

Fe₂O₃—0.40%

Al₂O₃—21.34%

CaO—1.50%

K₂O—11.85%

MgO—Trace

Loss—.48%

FULLER'S EARTH (See Jens, under Diatomaceous Earth).

GOLD.

LOS BURROS DISTRICT.

The Los Burros Mining District is in the extreme southwestern part of Monterey County in T. 23 and 24 S., R. 5 E., M.D.M. It is best reached from the railroad at King City, by stage to Jolon and then by trail.

The first work in the district was in 1887 when W. D. Cruikshank discovered a small quartz vein carrying free gold. The discovery led to the development, on a considerable scale, of the Last Chance Mine, now owned by the Buclimo Mining Company. The property has been worked intermittently ever since.

Discoveries of placer gold in 1902 were made on Willow and Dogvine creeks and the Gorda and Plaskett mines were started. Placer work extended to all the nearby ravines.

From the years 1888 to 1915, inclusive, the district is estimated to have produced over \$150,000 in gold.

Bibl.: Rept. VIII, Cal. State Min., 1888, pp. 405-410; Rept. XI, Cal. State Min., 1893, pp. 259-262; Rept. XII, Cal. State Min., 1894, p. 184; Rept. XIII, Cal. State Min., 1896, p. 234; Mining and Scientific Press, vol. 104, pp. 696-698, 1 fig., May 18, 1912.

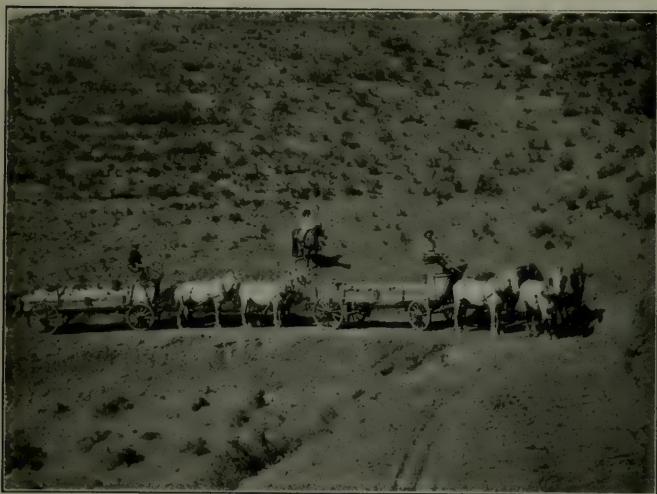


Photo No. 7. Hauling feldspar from Jens Quarry near Chualar, Monterey County. Photo by J. C. Jens.

The **Brewery Mine**, of which J. M. Krenkel of Gorda is manager, is located in Sec. 2, T. 24 S., R. 5 W., M.D.M. The gold is free in a quartz vein in slate and is said to average about \$8.00 per ton.

The **Brooklyn Mine** is being developed by open cuts. Owned by Jas. H. McNeil of Gorda.

The **Buclimo Mining Company**, C. E. Gilman, San Francisco, president, has taken over the Last Chance and the New York and Cruikshank properties, in Sec. 2, T. 24 S., R. 5 W., M.D.M. The claims, at an elevation of about 2800 feet, are 50 miles southwest of King City,

the nearest railroad station. A good automobile road leads through Jolon to the Nacimiento River, whence the territory is accessible only by a steep, narrow, mountain trail over which mail is packed once a week. Freight by trail costs $1\frac{1}{2}$ cents per pound to Los Burros, and 2 cents to Gorda.

The names of the claims are as follows: Last Chance, East Extension No. 1, West Extension No. 1, Mary S., Mary S. Extension, Gold Gulch Nos. 2, 4 and 5, Good Gold, Flat View (Camp site), Ora F. Nos. 1 and 2, Rankin, Perry, Luckie Jim and Pansy Fraction (timber claim). The topography is rugged and broken up by intrusions of serpentine. Water is obtained from the mine workings and from Spruce Creek. The average annual rainfall in the region is about 39 inches. Redwood and pine timber are obtained from the government reserve and cost about \$18.00 per thousand, laid down at the mine.

The gold occurs in 3 parallel quartz veins in slate near its contacts with serpentine. The ore is free milling on the surface, but sulphides are encountered below the water level. The width of the veins varies from 10 inches to 3 feet. They strike N. 45° W. and dip about 35°. The ore occurs in pockets and is said to run about 2% sulphurets. It is said to average from \$20 to \$50 per ton in free gold. The present workings consist of a 197-foot incline shaft on the ledge, with 2 levels, and 360 feet of tunnels. An 1800-foot tunnel is being driven 300 feet east of the old shaft with the intention of tapping the ledge at a depth of 485 feet and to furnish drainage. Equipment consists of steam hoist, steam pump and bucket. Two shifts were reported to be working in July, 1916.

The mill equipment consists of a 5-foot Huntington mill and ore crusher, a Frue concentrator, Hendy self-feeder, 11-foot apron and 20 feet of 12-inch sluice pans. J. M. Krenkel, of Gorda, is manager of the property.

Other claims in the same region, reported on in 1888, have been abandoned. The following are included: Black Crystal, Stonewall, Ajax and Scorpion.

The **Bushness Mine** is located on Spruce Creek. Mr. John Bushness has run a 50-foot tunnel on a quartz vein in slate. A one-stamp mill on the property is run by a gas engine. The ore in places carries values as high as \$35.00 per ton. Some placer work is carried on during the rainy season and one 104-dollar nugget is said to have been found. Mr. Roberts is doing some prospecting and placering below Mr. Bushness' claims.

The **Gorda Mine** is located on Spruce Creek about one mile below the Buclimo mines. It is in Sec. 3, T. 24 S., R. 5 E., M.D.M., at an elevation of 2000 feet.

Water is obtained from springs on the north side of Spruce Creek. Considerable pine and redwood timber grows on the claims.

The workings consist of a 50-foot drift in loose Franciscan sandstone along the south side of Spruce Creek. Mr. Geo. Reed of Gorda manages the workings and has three men employed. Owned by the Gorda Gold Mining Co., Gorda, Monterey County, Cal.

The **Howard Mine**, formerly the Plaskett Mine, leased by W. C. Howard of San Francisco from L. M. Plaskett of Gorda, is located in Sec. 20 of T. 23 S., R. 5 E., at an elevation of about 900 feet. Considerable redwood and pine timber grows on the property. Water is obtained from the headwaters of Plaskett Creek by 1800 feet of two-inch galvanized iron pipe.

The gold is obtained from a quartz vein in Franciscan sandstone, varying in width from two to eight feet. The ore is taken from a 45-foot incline shaft. The gold is extracted by a $3\frac{1}{2}$ -foot Huntington mill, which is run by a gas engine.

The **King** claim has an 18-inch vein. Development consists of two tunnels 100' and 150' deep and a 180-foot incline shaft. This claim used an arrastra in the early days.

The **Manchester** or **Blue Jay** claim has two 10-inch veins along the slate-serpentine contact. The ore carries free gold in quartz. It has a 135-foot tunnel with a 35-foot shaft and 64 feet of drift. Five-stamp mill operated by a 5 h.p. gasoline engine. Owned by Samuel Pugh of Gorda.

The **Mariposa Mine**, owned by Samuel O. Pugh of Gorda, is located in Sec. 2 of T. 24 S., R. 5 W., at an elevation of about 2700 feet. It is near Spruce Creek and includes the following claims: Blue Jay Nos. 1 and 2, San Lucas, Protection, and McKinley. The gold occurs free in a quartz ledge which carries some arsenopyrite. A 60-foot incline shaft and 30 feet of drift following the vein have been driven in course of assessment work. Ten tons of ore on the dump.

The **Oregon Mine** adjoins the Mariposa mine and consists of the Oregon and Cool Spring claims. It is located in Sec. 2, T. 24 S., R. 5 W., at an elevation of about 2700 feet. J. M. Krenkel of Gorda owns the mine. The gold occurs free in a quartz ledge which carries some hematite near the surface. The lower part of the vein carries considerable arsenopyrite. A tunnel 128 feet to the vein with 80 feet of drifting and a 50-foot raise to the surface have been driven in course of assessment work.

The **Queen** claim has a 10-inch vein in slate with three tunnels 16', 40' and 70' deep, respectively.

JOLON DISTRICT.

The **Ruby Placer Mine** is located about three miles northwest of Jolon, on the Milpitas rancho in Old Man's Cañon. It is owned by Messrs. H. and W. T. Hess of San Francisco.

The topography of the region is rounded and the rock consists of loosely consolidated, nearly horizontally bedded gravels and sands which lie unconformably on the Monterey shales and sandstones. These gravels cover considerable areas to the northwest, east and southeast of Jolon. They cap the hills in many instances and in places are 150 feet thick.

In the spring of 1914 the Hess brothers installed a hoist with drag-line bucket. Water was obtained from dams in the cañons where winter flood waters were held. The gravel was washed through a rotary tube screen run by a gas engine. Several experiments were made and although it is said the color in the pan ran as high as 50¢ per cubic yard, the recovery with the screen and riffle board was too poor to make it a paying proposition.

Bibl.: Rept. VIII, Cal. State Min., 1888, p. 405.

PARKFIELD DISTRICT.

On the **Cholame Grant**, 7 miles southeast of Parkfield, there is a series of gulches with gravel deposits which have yielded some placer gold. It is locally known as "Gold Hill." L. Patriquin of Parkfield has a lease from R. E. Jacks Co., owner.

SUMMARY.

Gold in Monterey County is found in quartz veins in the metamorphic rocks and as placer gold in Pleistocene gravels. Gold in the quartz veins is free milling down to the water level and rich pockets have been found. The veins are narrow, however, and considerable wall rock must be worked. Below the water level, which is usually about 150 feet below the surface, sulphides are encountered. The value of these sulphides has not been fully ascertained but some specimens examined showed no secondary enrichment.

Placer gold has been obtained both from raised beaches along the west coast and from loose raised gravel deposits west of Jolon. Deposits of considerable extent remain which only await a profitable method for extraction.

LIME and LIMESTONE.

The **Mineral Earths Supply Company** shipped several hundred tons of limestone during the year 1914 from north of King City.

Deposits of considerable magnitude exist in the **Santa Lucia** mountains about three miles from the coast and extending roughly from

Bixby's Creek southward to Cone Peak. Pico Blanco (see Photo No. 1) is capped with limestone and isolated deposits occur overlying the Santa Lucia granite and interbedded with gneiss throughout the ranges southward. Marble Peak at the head of Lion Gulch contains considerable limestone and some marble, which dip about 35° NW. The deposits are interbedded with gneiss and faulting has broken them up to such an extent that a detailed examination would be necessary to determine their economic value. Deposits of possible economic importance occur on the ranch of Mr. John Little of Monterey, south of Point Sur; and on the 640-acre ranch of Mrs. C. L. Koch of Pacific Grove, in Sec. 36, T. 18 S., R. 1 E., which includes in part the deposit on Pico Blanco. A landing place suitable for shipping the latter deposit is said to exist north of Point Sur and 5 miles from Pico Blanco.

MAGNESITE.

L. E. Bedell of Parkfield has made locations on a deposit of magnesite in Sec. 28, T. 23 S., R. 15 E., east of Parkfield. Undeveloped.

MARBLE.

L. Patriquin et al. of Parkfield, have an undeveloped deposit of white marble in Sec. 6, T. 23 S., R. 14 E., near Parkfield. The ground is under lease to E. G. Lewis of Atascadero, who is drilling nearby for oil.

MINERAL WATER.

The following data on the mineral springs of Monterey County is taken from U. S. Geological Survey, Water Supply Paper No. 338.

"Dolan's Hot Spring. A warm and mildly sulphuretted spring exists on North Fork of Big Creek, about 1½ miles from the ocean and 7 miles by trail southward from Slates Hot Springs. The water issues in a deep portion of the cañon, which is heavily timbered with redwoods, and as the place is known only locally and is not easily accessible, the spring has not been made use of and has seldom been visited."

"Paraiso Hot Springs. Paraiso Hot Springs are situated near the head of a small valley that opens eastward to Salinas Valley. Underground water lies at a shallow depth near the springs, beneath an area of several acres within which at least five mineral springs rise. The largest of these, which is known as the Soda Spring, has an observed temperature of 111°, and a discharge of perhaps 8 gallons a minute. About 40 yards away two small Sulphur Springs rise with temperatures of 88° and 102°, and 100 yards farther east there are two drinking springs each of which yields perhaps one-fourth gallon

a minute. These are known as the Iron Spring and the Arsenic Spring and have temperatures respectively of 68° and 65° F.

"The springs at this place were known to the Catholic Mission Fathers, who at one time lived there. Their extensive modern use dates back more than 20 years, and their accessibility has made them an objective point for automobile parties. In 1908 accommodations were provided in hotels and cottages for about 200 guests, while tub and plunge baths at the Soda and the Sulphur springs, and a swimming plunge that was also supplied by these springs, gave ample opportunity for use of the waters. Analyses of the springs, made a number of years ago, are available and are here presented in the standard form.

Analyses of Water from Paraiso Hot Springs, Monterey County, Cal.
(Constituents are in parts per million.)

	1	2	3	4	5
Temperature -----	45° C. (118° F.)	48° C. (118° F.)	46° C. (114° F.)	21° C. (70° F.)	21° C. (70° F.)
Properties of reaction:					
Primary salinity -----	81	85	69	51	82
Secondary salinity -----	2	0	10	0	17
Persalinity -----	0	0	0	0	1
Primary alkalinity -----	0	2	0	11	0
Secondary alkalinity -----	17	13	21	38	0
Subalkalinity -----	22	12	39	28	51

Constituents	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.	By weight.	Reacting values.
Sodium (Na) -----	253	11.00	252	10.96	233	10.13	234	10.18	179	7.78
Potassium (K) -----	2.9	.07	3.1	.08	6.4	.16	80	2.05	58	1.48
Calcium (Ca) -----	41	2.04	32	1.60	28	1.40	30	1.50	23	1.15
Magnesium (Mg) -----	7.5	.62			38	3.13	74	6.09	9.8	.81
Iron (Fe) -----	7.3	.26	19	.68	9.7	.35	12	.43	3.9	.14
Aluminum (Al) -----	5.1	.56								
Sulphate (SO ₄) -----	493	10.27	463	9.64	520	10.83	23	.48	22	.46
Chloride (Cl) -----	38	1.07	39	1.10	29	.82	342	9.65	387	10.92
Carbonate (CO ₃) -----	79	2.63	56	1.87	94	3.13	304	10.13		
Arsenate (AsO ₄) -----						Trace	Trace			
Silica (SiO ₂) -----	50	1.66	45	1.49	44	1.46	156	5.18	176	5.84
	977		917		1,002		1,255		859	
Carbon dioxide (CO ₂) -----	25	1.14	(a)		17	.77	(a)			
Hydrogen sulphide (H ₂ S) -----					60	3.52				

(a) Present.

1. Hot soda spring. Analyst and authority, Winslow Anderson, 1889.
2. Hot soda spring. Analyst, A. Cihl, 1871. Authority, U. S. Geol. Survey Bull. 32.
3. Hot sulphur spring. Analyst and authority, Winslow Anderson, 1889.
4. Arsenic spring. Analyst, A. Cihl. Authority, advertising matter.
5. Iron spring No. 2. Analyst, A. Cihl. Authority, advertising matter.

"The Hot Soda Spring is primarily saline in character with secondary alkalinity as a subdominant property. The term "soda," usually referring to primary alkaline waters, is a misnomer. The Hot Sulphur Spring differs from the Hot Soda Spring chiefly by

reason of higher secondary salinity and its content of hydrogen sulphide. The analyses of the Arsenic and Iron springs are of doubtful authenticity. It is of interest that only a trace of arsenic was found in the Arsenic Spring and very little iron in the Iron Spring. Both have primary salinity for the principal property. High magnesium with respect to calcium is indicated for the Hot Sulphur and Arsenic springs.

“The hills on each side of the little valley at Paraiso Springs consists of gravelly sandstone that dips gently away from Salinas Valley. Granitic boulders scattered along the ravines indicate that crystalline rocks are exposed to the west. Although a fault is mapped through Salinas Valley, it is not believed that such structure has given rise to Paraiso Springs. It seems more probable that some local fold or bedrock obstruction here forces underground water to the surface, and that its thermal character may be due to the depth from which it rises, in a locality of unusually high temperature gradient.”

“**Slate's Hot Springs.** In the Coast Ranges of Monterey County thermal springs of note issue at four places. The southernmost of these is at Slates Hot Springs, on Mr. J. A. Little's ranch. The water here issues at ten principal points in a distance of 125 yards, halfway up the face of the bluffs that here border the ocean. A small private bathhouse has been built near the easternmost spring. The waters range in temperature from 110° to 121° F., are mildly sulphuretted, and the run-off streams are lined with abundant green algaous growth. Small deposits of alum, gypsum, and carbonate of lime or magnesia were noted at the edge of one spring. The waters taste distinctly sweetish.

“About one-fourth mile northwest of the main group, on the left bank of Hot Creek, is another spring, 98° in temperature. This spring yields perhaps 5 gallons a minute and is used for laundering clothes.

“It is said that the location of the springs was described by an Indian to Mr. Thomas B. Slate, who made his way southward with difficulty along the steep, brushy slopes, and succeeded in finding only the warm spring beside the creek. Later, however, he came down the coast in a boat, found the springs on the bluff, and settled near them in 1868. The locality is occasionally made a camping place by deer hunters, but as it is about seventeen miles by trail beyond the southern end of the wagon road, it is not often visited.

"The formation exposed along the bluffs is of slates that have been described by Fairbanks¹ as being probably of Jurassic age. They are overlain by 30 or 40 feet of gravel that is deposited on an ocean terrace along this portion of the coast. The heated water apparently emerges at the base of the gravel, though small warm flows also issue from the slate, close to the surf. It is said that when garden land on the terrace back of the springs has been irrigated for several weeks by a mountain stream the seepage water has so reduced the temperature of the hot springs that they are only tepid."

"Hot Springs on North Fork of Little Sur River. Several thermal springs rise in the bed and along the banks of North Fork of Little Sur River, about two miles above the point at which the stage road crosses the stream. The springs in the stream bed form a warm pool, and on its right bank two or three flows, having a maximum temperature of 114°, issue from crevices in the rock and fill a small natural basin. The springs are in a narrow, rugged section of the stream cañon, in a granitic area, and possibly rise along fractures that have been produced by local faulting. The water is mildly sulphuretted but it is not otherwise noticeably mineralized. A considerable amount of fibrous algaous growth, from white to reddish purple in color, is found in the stream and the adjacent pools.

"During the nineties the water was piped to a grove of redwoods in a flat some distance below the springs, and it was the intention to build a hotel and bathhouse. High water washed out the pipe line, however, and in 1908 the attempt to develop the springs had not yet been renewed."

"Tassajara Hot Springs. A large amount of hot water issues at Tassajara Hot Springs, which are in the cañon of Arroyo Seco, in the southern part of Monterey County. About seventeen thermal springs may be counted here, in the bed of the creek and along its southern bank. They range in temperature from about 100° to 140° and from mere seepages to flows of seven or eight gallons a minute.

"The thermal waters issue from a gneiss that is exposed along the creek for a distance of 200 yards or more. Above and below this exposure the rock is granitic and in some places contain small garnets. The crystalline rocks are overlain by a series of shale, sandstone, and limestone, whose structure in the area north of Arroyo Seco is well shown by the beds of massive buff-colored sandstone that dip northeastward at an angle of about 45°. A western limb of this structure was not seen, though it may exist in the mountains farther coastward. The observed dips at least suggest that Tassajara Hot Springs issue at a locality where Arroyo Seco crosses a zone of intense pressure in the crystalline rocks.

¹H. W. Fairbanks, *Stratigraphy at Slate's Springs, with some further notes on the relation of the Golden Gate series to the Knoxville*. *Am. Geologist*, vol. 18, pp. 350-356, 1896.

"The springs received their name from an Indian or Mexican word that means "the place where meat is cured by drying," and dates from the early days of the cattle industry. The springs have thus been known and used for many years, and they were early visited by campers, when the only access was by means of a difficult trail. Several years ago a well-graded wagon road was built southward from Jamesburg across the mountains and down into the cañon, and the springs are now easily reached by stage. In 1904 a stone hotel was built, and other improvements have been added yearly, so that in 1909 there were ample accommodations for 75 people, though a larger number has been taken care of by the use of tents. Water from two of the largest springs has been piped to tub and plunge baths, and a vapor bath has been constructed over the hottest spring, which issues in the creek bed.

"Analyses of two of the thermal waters were made. These waters are noticeably sulphuretted, and the analyses show them to be only moderately mineralized. The water of the arsenic spring has a distinctly yellow color, which in a few other springs has been ascribed to alkaline sulphides in solution.

"At the north edge of the creek, a few yards above the hot springs, there are two cool springs in which iron is deposited. An analysis of the easternmost of these springs is tabulated with the hot springs.

Analyses of Water from Tassajara Hot Springs, Monterey County, Cal.
(Analyst and authority, F. M. Eaton, 1909. Constituents are in parts per million.)

	1	2	3
Temperature	59°C. (138°F.)	39°C. (103°F.)	18°C. (64°F.)
Properties of reaction:			
Primary salinity	63	65	19
Secondary salinity	0	0	16
Persalinity	0	0	0
Primary alkalinity	30	26	0
Secondary alkalinity	7	9	65
Subalkalinity	138	104	-----

Constituents	By weight	Reacting values	By weight	Reacting values	By weight	Reacting values
Sodium (Na)	81	3.51	75	3.26	14	0.59
Potassium (K)	4.6	.12	4.8	.12		
Calcium (Ca)	5.3	.27	4.0	.20	33	1.64
Magnesium (Mg)	Trace	Trace	1.3	.11	11	.87
Iron (Fe)	1.5	.05	2.0	.07	0.8	.03
Aluminum (Al)						
Sulphate (SO ₄)	110	2.29	109	2.27	36	.75
Chloride (Cl)	6.5	.18	5.0	.14	12	.32
Carbonate (CO ₃)	41	1.37	38	1.28	61	2.03
Arsenate (AsO ₄)			(a) 0	.00	-----	-----
Silica (SiO ₂)	118	3.90	116	3.84	(?)	-----

Carbon dioxide (CO ₂)	368	-----	375	-----	170	-----
	0	.00	0	.00	(b)	-----
Hydrogen sulphide (H ₂ S)	25	1.47	(b)	-----	(?)	-----

(a) Not detected in 1 liter of water. (b) Present.

1. Lower of two main basins. 2. Arsenic spring. 3. Iron spring.

"The two hot springs were apparently from the same general source, showing only slight difference in composition. Primary salinity and primary alkalinity are the chief stable properties, but the waters are characterized by high subalkalinity, of which silica is the chief component. The carbonate radicle reported is presumably calculated from the alkalinity determination and doubtless includes sulphides and possibly silicates. The apparent absence of arsenic in the so-called arsenic spring is noteworthy.

"The iron spring is of markedly different character from the hot springs, being less than half as concentrated and having secondary alkalinity as the dominant property. Subalkalinity is not reported, but this property is probably relatively low. It is probably of essentially surface origin, and not directly related to the thermal waters.

"The following notes concerning algal growths in the creek below the hot springs are here given, as the growths are related to the sulphuretted character of the water. Although they are common to thermal sulphur springs, the relatively large volume of water in the creek at Tassajara Hot Springs, its comparatively slow cooling, and the presence of both swift currents and of quiet pools, affords an unusually good opportunity to observe the variation in character of the growth.

"At the main springs, where the temperature of the water was 110° to 140° , the material was mainly fibrous, and white, green, and reddish-brown in color.

"About 75 yards below, at a temperature of 96° , there was a dark-green layer on the bottom of pools, with a small amount of white material on the surface of the green. Where the current was swiftest a purple-brown, furry growth, one-eighth to one-quarter inch thick, covered the rocks.

"At 125 yards, where the temperature was 91° , a green, leathery growth covered portions of the bottom, with white, feathery streamers attached to it where the current was rapid.

"At 200 yards, in a temperature of 87° , a thick, leathery growth coated the entire stream channel, being green and white on its upper surface, pale purplish-red inside, and black on the under surface. A number of pale purple, feathery, and white threadlike streamers extended from it.

"At 250 yards, in a temperature of 83° , there was a layer of green material in the pools, and white material in the swifter water.

"At 275 yards, where the temperature was 81° , the lower limit of white growths was reached. Below it a dark green moss coated the

rocks for a distance of about 50 yards to a point where the temperature was 78°. Below this point there was no notable growth in the channel.

"The material showed a tendency toward brighter colors in the hotter water and more somber ones in the cooler places. White material (probably due to the deposition of sulphur) was more common in the hottest water and in the lowest portions of the algaous growth. Smooth, leathery growths lined the pools, while fibrous growths were formed in the swiftest currents. The discharge of the stream was approximately 100 gallons a minute. The water first rose at a point about 50 yards above the main springs. Above this point the stream channel was dry."

NICKEL.

Reported from localities in the mountains but no prospects developed.

QUICKSILVER.

Dutro Mine. Idle for several years; 100' shaft and 40' drift caved. Situated at head of west fork of San Carpojo Creek in SW. $\frac{1}{4}$ of SE. $\frac{1}{4}$ of Sec. 28, T. 24 S., R. 6 E. Owner, F. D. Martinez, Santa Maria.

Bibl.: Bull. No. 27, p. 124.

Parkfield Mine (formerly Cholame-Parkfield). Lewis and L. S. Patriquin, and J. W. Anderson, Parkfield, owners. This group of four claims and two fractions is in Sec. 2, T. 23 S., R. 14 E., 5 miles north of Parkfield; elevation 3000' (bar.) at the middle tunnel. It was first worked about forty years ago by a Mr. Pitts, who is said to have produced 60 flasks of quicksilver, using a small mud-plastered furnace.

The country rocks are serpentine and Franciscan metamorphic sandstone. The ore body is a zone containing parallel stringers of cinnabar with the intervening rock and its fractures more or less impregnated with the mineral. It is in part stockwerk. The vein filling is quartz, opaline silica, and chalcedony, and much of the serpentine is silicified. The cinnabar occurs as distinct crystals, not as "paint." There is also some metacinnabarite. There are two ore zones with a ridge of serpentine between them, the north one being 100' wide, and the other wider. The strike is a little north of west and the dip about 65° N. In these areas the surface soil yields cinnabar by panning. On the south vein at the west end, an old tunnel in 800' crosscuts six shoots, none of which have been drifted on. There is another adit in 950', about 500' of which is a drift. On the north vein, the middle adit crosscuts the ore zone for over 100'. Experiments are being made with a view to concentrating the surface soil

the product to be retorted. About \$6,000 worth of development work was done in 1913 by H. M. Newhall & Co. of San Francisco, under a bond which has since expired.²

Bibl.: Bull. No. 27, p. 123.

Table Mountain Claim. G. W. White, Parkfield, owner. This prospect is on Table Mountain in Sec. 30, T. 23 S., R. 16 E., about nine miles east of Parkfield; elevation 3350' (bar.) Cinnabar occurs with opaline silica in serpentine. Idle except for assessments. An old adit is being cleaned out.

Bibl.: Bull. No. 27, p. 124.

Several **quicksilver prospects** are reported in the southwest corner of Monterey County north of Mount Mars, but no real development work has so far been carried on.

SALT.

Salt is extracted from the sea water near Moss Landing. It is reported that the Vierra Brothers produce about 2,000 tons annually by solar evaporation.

GLASS, SAND.

The **California Glass Insulator Company**, H. G. Munn, of Long Beach, president, obtains glass sand from the dunes near Del Monte. Several hundred tons were shipped to their glass factory at Long Beach during 1913.

The **Carmel Development Company**, J. F. Devendorf, manager, Carmel, owns a deposit of white sand in the dunes along the shore of Carmel Bay. Some shipments for glass-making have been made.

The **Pacific Improvement Company**, A. D. Shephard, Crocker Building, San Francisco, general manager, produces annually several thousand tons of glass sand. The sand is loaded on the railroad cars directly from the sand dunes west of Pacific Grove by small steel dump cars on an elevated tramway.

SAND.

Lapis Sand Plant. The E. B. and A. L. Stone Co., H. E. Keifer, general manager, with offices in the Rialto building, San Francisco, has a plant from which sand is shipped for structural work (such as plaster and concrete), at Lapis Siding on the Southern Pacific R. R., on the shore of Monterey Bay. Operations were begun in 1907, and the plant has a daily capacity of 1000 to 1200 tons, using a locomotive

²Since the above was written, a letter received from Mr. Patriquin states that a 12-pipe retort has been constructed, and ore reduction began on April 15, 1915. About 1½ tons of ore averaging 5% quicksilver are being retorted per 24 hours. —W. W. B., Jan. 15, 1916.

crane and screening to three products. From the dunes a fine material is obtained which is utilized for sand blast work.

Quality Sand and Gravel Co., J. W. Leeper, manager, 503 Market street, San Francisco, is installing a plant to handle gravel and sand for structural purposes, at Neponsett station on the Southern Pacific R. R., near the mouth of the Salinas River.

SILVER.

Veins of galena and sulphuret of iron, thought to contain silver, were early reported in a white granitic rock at the Alisal Rancho, in Monterey County. Nothing in recent years has been learned of the deposits which were reported in the foothills on the east side of Salinas Valley about twenty-five miles from Mission San Carlos.

The silver of value thus far discovered has been taken from the placer gravels with the gold, along the west coast

Bibl.: Cal. Sen. Doc. No. 9, 1854, by J. B. Trask, p. 18.

SAN BENITO COUNTY

By WALTER W. BRADLEY and C. A. LOGAN, Field Assistants.
Field Work in September, 1914, and December, 1915.

HISTORY and GEOGRAPHY.

Crespi visited the region in 1772 and gave its chief stream the name of San Benedicto, in honor of Saint Benedict, but the name was later contracted to San Benito. The county dates its official existence from February 12, 1874.

With a population slightly over 8000 and an area of 1476 square miles, San Benito County is bounded on the north by Santa Clara and Santa Cruz counties, on the east by Merced and Fresno counties and on the south and west by Monterey. Most of the population resides in the few towns near the railroad in the northern part of the county.

The county consists topographically of a long, narrow valley flanked on each side by chains of the Coast Range, through which occasional passes give access to neighboring counties. Through this central valley the San Benito River flows the entire length of the county in a north-westerly direction, having Tres Pinos Creek as its chief tributary, with many smaller streams flowing in from east and west. The western range of mountains takes its name from Gabilan or Fremont Peak, which has an elevation of 3169 feet; the chain on the east is called the Diablo Range and rises in many of its peaks to elevations of nearly 5000 feet. Many small, fertile valleys lie on the mountain flanks, and in these live most of the people to be found in the southern half of the county. Fruit raising is an important industry near the railroad. Hay is raised in great quantity and the county claims to have the greatest hay shipping point in the state at Hollister. As in the other counties so early settled by Spanish and Mexican pioneers, cattle-raising became the leading interest at an early date and is still of prime importance.

Transportation facilities are limited. The Southern Pacific operates a branch line from Gilroy to Tres Pinos via Hollister, the county seat. Auto stages operate between Hollister and Sargent via San Juan Bautista and also give connection with the railroad at San Jose. Stage lines operate between Tres Pinos and San Benito daily, and via Panoche Pass to New Idria triweekly. The road crosses the river at many places where there are no bridges, and heavy rains therefore delay traffic, as the streams rise suddenly, and easily become unsafe to cross. The southern section of the county has no transportation facilities, but can be reached through Coalinga or Kern City; New Idria, east of the mountains, reaches the railroad easiest at Mendota.

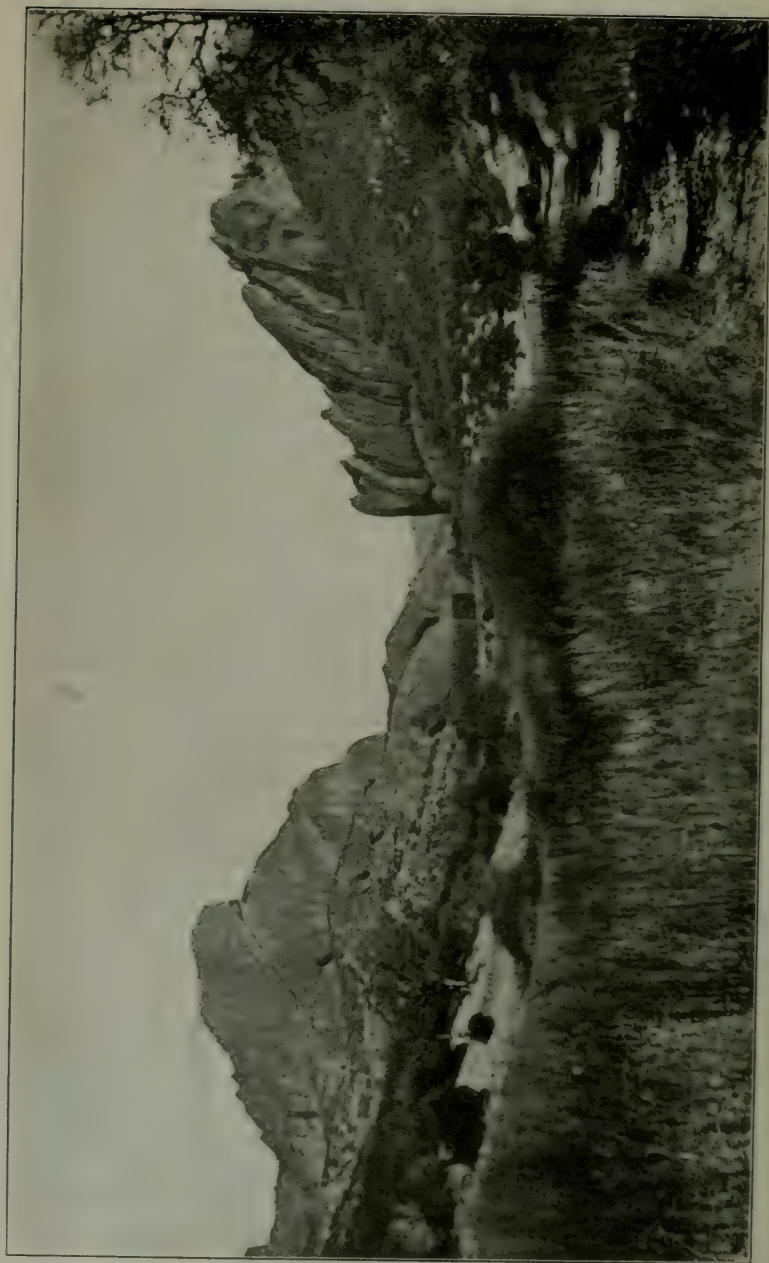
GEOLOGY, AREAL AND STRUCTURAL.

The county's geology has never been fully covered by any writer, but various geologists have visited sections of it and have recorded their observations. The writers' observations were necessarily confined to a hurried study of those mineral deposits which were working at the time of our visits or promised to become of especial interest because of present conditions. The following lines give an idea of general relations, and no attempt is made to go into details:

Structurally, the county shows two mountain piles of apparently diverse geologic formation, striking northwest and separated by a narrow valley filled with younger formations and detritus. Traversing the valley is the San Andreas Fault Zone, along which fresh movement occurred at the time of the San Francisco earthquake of 1906. On the southwest of this zone, forming the basement of the Gabilan Range and outcropping at places through the whole length of the county, granite and associated schists occur. Associated with these, over several square miles surrounding and including Gabilan Peak, are notable beds of metamorphosed limestones with which, as described particularly farther on, are deposits of barite and dolomite.

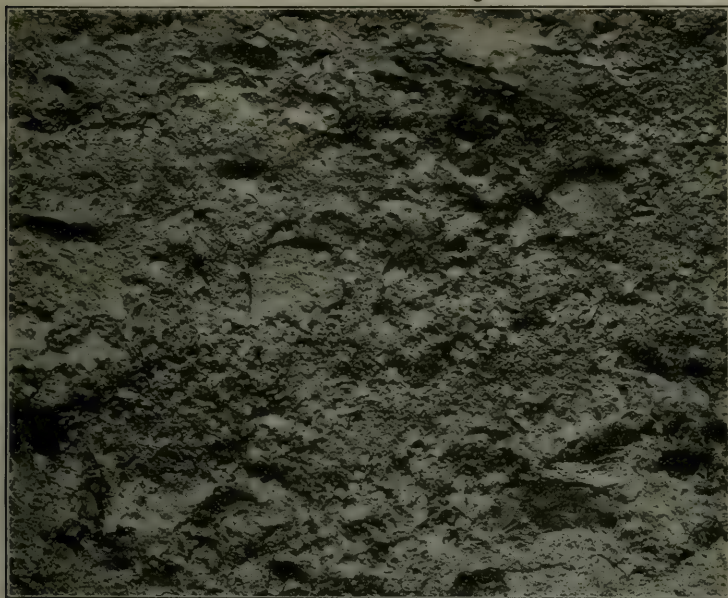
Volcanic activity is not indicated in this section, but as we go south toward The Pinnacles conditions change. To within a few miles of The Pinnacles National Monument (a government reserve) the higher mountain country is shown to consist of granite; the northern branch of Chalone Creek carries only detritus of granitic origin. But just south of this stream, rocks of shallow igneous origin appear.

The Big Pinnacles, situated near the Monterey-San Benito counties boundary, deserve mention. Apparently intense vulcanism here has resulted in the piling up of a great mass of peculiar tightly consolidated agglomerate which is now separated by a narrow cañon into two mountains but whose position, composition, and nearness to a great fault zone suggest their original unity and the cause which quite probably separated them. The accompanying photographs taken by the writer give a clear conception of the appearance of the rock formation close up, and a view of the mountain pile. The larger fragments of the breccia are 3" to 6" across. The southeast scarp is known as The Knife Blade and rises in a smooth vertical face to a distance stated locally to be 800 feet above the stream, with a reputed surface area on the cañon side of twenty acres. The northwestern mass is called The Palisades and rises in three roughly defined terraces with steep faces, reputed to be 500 feet apart vertically. The cañon between The Knife Blade and The Palisades is in places scarcely 6 feet wide at the bottom. Into the chasm great blocks from the mountain have fallen. Many of these are too large to reach the bottom and have formed a natural tunnel in one



The Big Pinnacles, San Benito County, looking northwest.

place, through which a little stream flows. This tunnel offers the easiest means of crossing the divide. The trip through it involves a climb of several hundred feet with candles. The gorge is about a quarter of a mile long and courses north, with a bend to the northeast. The elevation of the valley floor is about 1500 feet.



Rock formation of The Pinnacles, San Benito County.

Beginning at The Pinnacles are fine-grained volcanics exhibiting flow structure at places and apparently rhyolitic. The Pinnacles appear to be composed of fragments of this material mixed with a more basic rock of reddish color. These light gray eruptives are found south of the South Chalone Peak, where a more basic material, suggesting andesite, appears. On the ridge one mile northeast of North Chalone a tunnel has been driven into the hill a distance of 540 feet and is entirely in this light gray eruptive, which shows no marked fracturing or other sign of movement after it cooled. Over this tunnel on the surface the material shows flow lines and dendrites of secondary manganese.

Southeast of South Chalone in the Topo country the granite basement has been eroded and the resulting sand has been covered by Monterey sand carrying bitumen and giving rise to bituminous sandstones. Diatomaceous earth occurs here also as a portion of the Monterey formations.

From the Topo Valley south and east to near Lookout Mountain the Tulare formation of Pliocene age is much in evidence because of the numerous gypsum beds in it. The gypsum occurs, where mined, with a thinnish overlying stratum of clay, with small sandstone streaks and gypsum pebbles. The district is cut up into gently sloping residual mountains and the gentle dip of the gypsum beds (5° or 6°) suggests a low anticline. The county from Topo Valley to Priest Valley has been prospected considerably for oil but the results of this work have been mostly negative, as far as commercial production is concerned, although traces of gas and oil were obtained at several wells. Upper Miocene beds



A mountain split in two; effect of an immense earth slide. Near Pinnacles, San Benito County, California.

predominate east of the fault zone to near the San Benito River. Small deposits of coal are found at places in this. The river for quite a distance, as followed by the road from Hernandez to the Fresno County line, flows over a coarse, well-cemented conglomerate. Dark clay shales are exposed in the Niesen mine tunnel in Sec. 31, T. 18 S., R. 12 E. and along the cañon. These strata are probably of Cretaceous age.

The Franciscan metamorphics appear about two miles north of the San Benito River. The country from here to New Idria is serpentine, deeply weathered into rounded knobs bare of grass and carrying only a few pines. The geology of this district, which is noted for its deposits

SAN BENITO COUNTY—Table of Mineral Production.

Year	Quicksilver		Lime and Limestone		Gypsum		Mineral water		Stone Industry value	Miscellaneous and unapportioned	
	Flasks	Value	Barrels	Value	Tons	Value	Gallons	Value		Kind	Value
1865	117,453	\$912,917									
1866		6,525	316,673								
1867		11,493	827,590								
1868		12,186	586,662								
1869		10,315	473,459								
1870		9,868	667,373								
1871		5,180	516,156								
1872		8,171	538,714								
1873		7,735	621,353								
1874		6,911	726,869								
1875		8,432	716,561								
1876		7,272	819,968								
1877		22,600	139,000								
1878		5,318	235,567								
1879		5,138	100,000								
1880		4,425	132,048								
1881		3,299	99,479								
1882		2,775	82,778								
1883		1,953	55,123								
1884		1,006	46,123								
1885		1,625	31,263								
1886		1,114	35,178								
1887		1,106	49,713								
1888		1,890	80,588								
1889		1,320	56,100								
1890		880	41,100								
1891		977	31,250								
1892		747	35,358								
1893		818	31,523								
1894		869	31,105								
1895		1,963	40,000	\$44,000	712	\$6,111				58 tons antimony	\$2,280
1896		1,100	39,000	41,000	750	8,250			\$13,000	2 tons antimony	70
1897		1,333	46,785	10,000	35,000	360	3,600	5,000	\$300	2 tons antimony	90
1898		3,605	155,155	25,000	19,500	300	3,000	500	150	45 tons coal	135
1899		5,000	176,000		300	3,000	500	150	\$17,500	19 tons asphalt	580
1900		4,780	215,000	16,000	18,875	200	4,000	1,000	\$25,240		
1901		3,590	180,000	7,300	18,875	100	700	10,000	3,750		
1902				\$100	100						
1903		4,800	242,300				500	125	\$12,791		
1904		7,291	360,081				900	150	22,000		
1905		8,180	311,251				70,000	400	7,150		
1906		7,850	311,000						7,560	206 tons asphalt	3,472
1907		7,704	279,671				500	600	64,291		
1908		7,208	270,900						3,120		
1909		7,675	2,25,878	8,163	5,453				2,600		
1910		9,690	406,792						18,667		
1911		8,900	410,511						2,600		
1912		10,880	438,700						2,600		
1913		9,773	429,718						3,120		
1914		9,748	400,596						1,810		
1915		9,719	290,099						2,600		
1916		8,633	333,301						15,500		
1917		6,291	472,370						200		
1918							1,200	300	155,800	200 M brick 2,500 tons dolomite Other minerals	1,660 9,900 383
Totals	226,899	\$1,551,450	\$189,928	78,712	\$2,8705	158,720	\$25,415	\$1,111,619			\$163,232

¹Production of New Idria Mine from 1858-1860, yearly details not obtainable.

²Estimated output of Cerro Bounto, Monterey and Niyaton mines, 1859-1871; yearly details concealed under heading of "various mines" in early reports.

³Includes bituminous rock.

⁴Tons of limestone.

⁵Flasks of 75 pounds since June, 1904; of 703 pounds previously.

TOTALS

Quicksilver	\$11,551,450
Lime and Limestone	189,928
Gypsum	2,8705
Mineral water	25,415
Stone Industry	1,111,619
Miscellaneous and unapportioned	163,232
Total	\$16,260,697

of quicksilver, is discussed in detail under the title of Quicksilver in this report. Franciscan rocks instead of granite form the visible basement of the Diablo Range, which extends along the eastern portion of the county, outcropping at many places along the summit, though mostly covered on the mountain flanks by younger formations. From New Idria to Little Panoche Creek, the geology has been studied in considerable detail by Robert Anderson with especial reference to the occurrence of oil. His report in Bulletin 603, United States Geological Survey, may be studied with profit by those interested in petroleum. The geology from here northward exhibits no striking variations from the usual Coast Range occurrences. Little if any volcanic activity is recorded in the region. Some manganese deposits occur along the mountain tops in association with Franciscan cherts, and as we approach the northwest corner of the county some interesting occurrences of stibnite occur, in a region distinguished by extreme volcanic activity in the past, which gave rise to several prominent peaks.

MINERAL RESOURCES.

The county's mineral resources are diversified, but have remained largely undeveloped because of the lack of transportation facilities and possibly also because many deposits are on land held under agricultural patents by people not interested in mining.

Production of the following metals and mineral substances has been made in greater or less quantity: Antimony, asphalt, bituminous rock, bituminous coal, dolomite, gems, gypsum, lime and limestone, manganese, mineral water, rock, quicksilver, and petroleum. Quicksilver has given the county its reputation in the mining world. The county is the largest producer of mercury in the United States. The next important item in mineral production is the crushed rock industry. San Benito has the largest single producer of this class of material in the state. Limestone and lime were produced in some quantity from 1894 to 1907, but no production has been reported since, although the limestone resources are immense in quantity and of very high quality. Gypsum production has gone on since 1894, but the table does not show the full amount produced recently in the county, as a considerable tonnage mined in the Bitterwater Valley has been credited to Monterey County.

Small tonnages of asphalt, coal, antimony and manganese have been produced, and interest in the two latter minerals is strong at present on account of high prices. Mineral water has been produced in small quantity for twenty years. Benitoite, a new gem not found elsewhere as yet, has been mined in the southern part of the county. Dolomite deposits have been opened within the past year in the county and have yielded considerable amounts of a high-grade product to fill a Pacific coast demand.

Undeveloped deposits of barite, high grade clay, coal, infusorial earth, iron, magnesite, manganese and petroleum exist in the county. Their development at present is greatly hampered by lack of transportation facilities. Prospects of gold and copper have been worked, but no showing of either metal in mineable quantity has as yet been made.

ANTIMONY.

Antimony is found in the northeast corner of the county in the mountains of the Diablo Range. There appear to be several distinct lines of croppings which carry the ore in siliceous gangue in brecciation zones where the volcanic fragments of light colored tuff and associated igneous rocks, classified by different writers as trachytes, asperites, and rhyolites, are seen cemented together by the mineralized solutions. The ore occurs in lenses. The strike of the lines of outcroppings is nearly due northwest and the lenses lie with long dimensions along these lines, and with varying dips. There has been very little work done at depth on any of these deposits except at one property. Considerable work was done here about 1875 on quicksilver prospects which pinched out when it was attempted to work them at depth; it was noticed, however, that stibnite was quite common and this led to prospecting for further quantities. In the '80's an antimony smelter was erected near the old Shriver Mine but no success ever was attained in treating the ores.

Ambrose Mine. (See Rip Van Winkle.)

Appeal Mine. This is an extension of the Shriver. It is now owned by T. H. French, of Hollister, and no work has been done on it since 1896. One shipment of antimony was reported from the property in 1893.

Bibl.: State Mining Bureau, Bull. 38, p. 260; Rep. X p. 516.

Florence Mine Group. This group of 6 claims is situated in the SE. $\frac{1}{4}$ of Sec. 8, T. 12 S., R. 7 E., 14 miles northeast of Hollister on the side of Henrietta Peak. The group includes part of the holdings of the old Stayton Quicksilver Mine. The ground was located for that metal in 1870. There was some indication of cinnabar in the surface zone, but investigation showed a decrease of cinnabar and a noticeable increase of antimony ore below the surface. The ground has lain idle for a long time. It was relocated in October, 1915, by George W. Clark, W. H. Florence and wife, G. E. Ray, and Ernest Stayton. Only surveying had been done at time of this report.

French Antimony Group comprises 4 claims in the NW. $\frac{1}{4}$ of Sec. 5, T. 12 S., R. 7 E., one mile north of the Florence Group, and relocated about the same time and by the same group of people. The property was formerly worked for quicksilver by the Gypsy Mining Company. Little success is said to have attended their efforts. Stibnite seems to

be the commoner mineral on this slope of the mountains, although on the east cinnabar has been worked successfully. The antimony ore occurs in prominent croppings which strike due northwest and are contained in a quartzitic gangue not notably different from the occurrence at the mines noted below. No recent work has been done to develop the antimony, though there are some old workings left by the quicksilver miners.

Bibl.: State Mining Bureau, R. X, p. 515-517.

Gleason Mine, owned by Wiley Garner, of Hollister, is situated in Sec. 6, T. 12 S., R. 7 E., 14 miles northeast of Hollister. The property was first worked over 30 years ago. The work was strictly superficial. A lens of brecciated rock, mineralized by solutions carrying silica and stibnite was uncovered. It was 20' long, 12' wide and 2' thick. It yielded 10 tons of about 50% stibnite. No other work sufficient to develop further ore bodies was attempted until the fall of 1915, when L. H. Day and H. W. Underwood, of Hollister, drove a tunnel 10 feet below this lens and uncovered some stibnite of good grade showing an oblique width of 3 feet directly below the old lens. Their work had not been carried far enough to show the amount of ore, but the indications were that the stibnite uncovered was the tip of the old lens. The outcrop is prominent, and quartzitic rock carrying needles of stibnite can be broken from it in many places. The grade of this scattered ore is too low for working profitably. The mineable lenses occur in places where brecciation is plainly noticeable and where fragments of shattered rhyolite or kindred rock, now mostly softened and altered, have been cemented by the mineralized solution. The outcrop strikes northwest and the lens lies with its long dimension along the strike, and a dip of 45° NE.

Bibl.: State Mining Bureau, Bull. 38, p. 260.

On the **Rancho Santa Ana y Quien Sabe**, about 4 miles south of the Gleason Mine, croppings of high-grade stibnite are reported but there has been no attempt to develop them. Cebrian Bros., Tres Pinos, Cal., owners.

Rip Van Winkle Mine, formerly known as the Ambrose Mine, was relocated in June, 1915, by its former owner, Joseph Bishop, of Hollister, after lying idle for 25 years. Bishop worked the property formerly through two tunnels, one of which, about 365 feet long, is now partly caved and is not being used. The other tunnel had been driven to a distance of about 400 feet in December, 1915. A short raise started years ago has been abandoned.

The croppings at this mine, as at all the others located for antimony in the district, strike northwest and dip northeast about 60° or 70°, showing prominently through the hill. The mineralized zone consists

of a quartzose gangue, enclosing small bunches of stibnite 2' or 3' wide, which occur along the strike at irregular intervals and are connected by narrow stringers sometimes only an inch wide. The ore lies mostly on the footwall side, and there may be several feet in width across the vein which are nearly barren. The distance which Bishop has followed the vein with success indicates a more persistent ore occurrence than is usually found in Coast Range deposits.

The ore is mined by hand and hand sorted. The owner has sold several small lots in San Francisco since June, 1915. Teaming to Hollister costs \$5.00 per ton, with a charge of \$3.76 per ton for freight from Hollister to San Francisco.

Bibl.: State Mining Bureau, Bull. 38, p. 260; R. X, p. 517.

Shriver Mine, in Sec. 31, T. 11 N., R. 7 E., is located on one of the three prominent lines of outcroppings noted in the district, and lies between the Bishop and Garner properties. The "vein" is in places 16 feet wide and strikes northwest with a dip of 60° to 70° NE. A large amount of underground work, described in detail in past reports, was done partly in a search for cinnabar and partly for stibnite, but no satisfactory body of either was found. The property is now owned by T. H. French of Hollister.

Bibl.: State Mining Bureau, Reports VIII, p. 485; X, p. 516; XI, p. 371; Bull. 38, p. 260.

ASPHALT.

Natural asphalt occurs in Sec. 29, T. 17 N., R. 8 E., and has been utilized in a very small way in the past.

Matthews Quarry, John Matthews, owner, King City, Cal., is located in the above section. Here the granite basement of the Gabilan Range was eroded, giving rise to a talus slope on the east, with a thickness of about 10 feet. Monterey sand and shale have been deposited over this and the heavy oil rising along the Monterey shales has been handled for street work. A production of 225 tons was reported for the period from 1899 to 1904. The deposit is about 10 miles northeast of Metz, near a good road.

Bibl.: U. S. G. S. Annual Report XXII, Part I, p. 409.

BARITE.

On the **Bardin Ranch**, which includes a part of Gabilan Peak (also known as Fremont Peak), some outcrops of barite have recently attracted attention. These croppings were investigated as early as 1864 by miners who believed for a time that they had discovered silver ore, but who abruptly ceased prospecting when they found no silver values. In the summer of 1915, L. H. Day and H. W. Under-

wood, of Hollister, took an option on the property and made a few shallow prospect cuts.

The best defined cropping is on the southwest flank of Gabilan Peak, where a body of high-grade barite with a maximum width of 6 feet strikes about 20° NE., 60 feet. It is enclosed between steeply dipping walls of highly silicified limestone and has not been prospected enough to permit a reliable estimate of the amount available. About 1750 feet, a little north of west from the first cropping, occurs another small body of barite, on the same slope of the ridge; 1500 feet further west, still another. These are all of the outcrops mentioned by the people who were prospecting there. When the writer visited the region



Gabilan (Fremont) Peak, San Benito County, showing outcrop of barite under oak tree in center.

he observed, besides the above, an outcrop on the north flank of Gabilan Peak, about half way to the summit, another small patch one-half mile north of the peak and a third on the hill southwest of the Steinbach orchard, associated with limestone. The material is pure white and highly crystalline. When struck by the pick it gives off the characteristic fetid odor. Assays made show 98.6% and 99.7% barium sulphate, according to Mr. Day. The location is about 9 miles from San Juan Bautista and fourteen miles from Betabel station, with

a fair road most of the way. Bardin Bros., of Salinas, are the owners. The deposit is being opened up by Wm. A. Farish, Jr., of San Francisco.

BITUMINOUS ROCK.

Matthews Quarry, John Matthews, King City, owner; also known as Topo Paving Co. This is a small quarry in bituminous sandstone, formed where Monterey shales occur, covering a talus slope which has resulted from the weathering of the granite basement, directly below. The quarry is partly in the granite sand and partly in the Monterey formation, the bitumen having penetrated down in the talus. The deposit is in Sees. 32 and 33, T. 17 S., R. 8 E., 10 miles from Metz. The distance from the railroad and the comparatively small size of the deposit precludes the possibility of it ever being of much economic importance.

Bibl.: U. S. G. S. Annual Report XXII, Part I, p. 409.

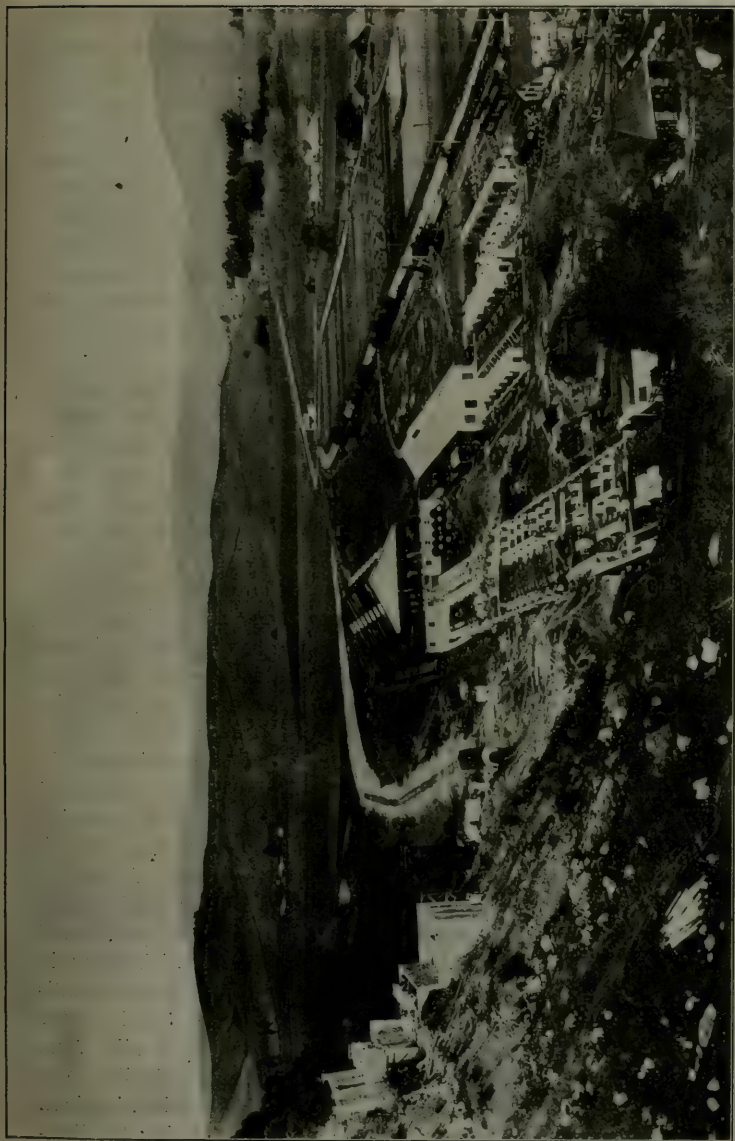
BRICK.

Clay of good quality for making common bricks is abundant along the streams where they course through the younger sedimentary beds. A good deal of this was utilized years ago to make bricks for quicksilver furnaces. Late in 1915 the Alpine Quicksilver Mining Co. burned about 260,000 bricks on lower Clear Creek, to be used in building their new 20-ton Scott furnace and condensers. No production other than for local use of this kind has ever been reported from the county.

CEMENT.

The deposits of limestone in this county which are suited for the manufacture of Portland cement are large, and are fairly well situated as regards mining and transportation. Particular mention is made of the larger deposits under the head of Limestone, and the reader will note, by reference to that section, that many of these beds are owned by large cement manufacturers. Only one corporation, however, has so far undertaken the erection of a cement plant in the county.

Old Mission Portland Cement Co., Baron Kemp Van Ee, president, Crocker Building, San Francisco, Cal., began in 1903 the erection of a cement plant just outside the town of San Juan Bautista, but work was interrupted by financial difficulties and the establishment has never been completed. In connection with the cement factory a lime plant was erected. This is fully described under the heading of Lime. Including the factory site, the company owns 1453 acres of land in San Benito County, on which are three limestone deposits. They also



Partially constructed plant of the Old Mission Portland Cement Company, San Juan Bautista, California. Photo by S. D. Lemar.

have mineral rights on 8750 acres on and near Gabilan Peak, with water rights in San Juan Cañon, and a narrowgauge railroad to the limestone deposit. From the plant to Chittenden, on the Southern Pacific Railroad, the company constructed a broadgauge line known as the California Central Railroad. This gave access to trunk lines for transporting the prospective output, and tapped the clay and shale deposits near Chittenden, which were to be utilized in cement making.

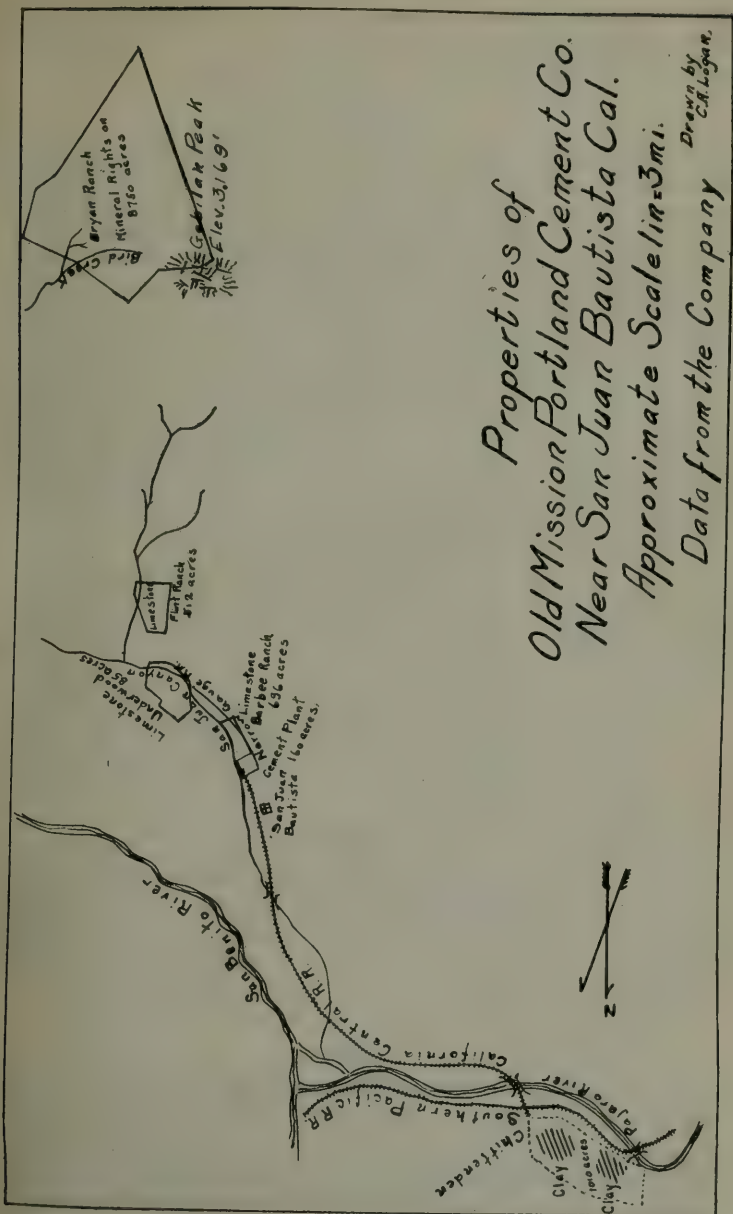
Practically all of the heavier equipment, except the conveyor system, is on the ground; this includes 1 No. 8 and 5 No. 4 gyratory crushers, 7 ball tube mills, to be steel-lined for wet process, 6-100-foot cement kilns (which it is planned to convert into 4-150-foot kilns), 4-6'x60' dryers, and about \$50,000 worth of electrical machinery. Completely equipped office, laboratory and machine shops, as well as a large stock house, are finished and ready for work, but only the concrete foundations of the cement factory are laid.

For quarrying the limestone and clay beds, two Marion steam shovels were provided. Two dinkey locomotives and ore cars are also owned, to handle the quarried limestone, and the narrowgauge railroad is built to the Underwood limestone bed, $2\frac{1}{2}$ miles from the plant. The broadgauge line is equipped with locomotive and rolling-stock. The plant is designed to have a capacity of 3000 barrels of cement daily, working by the wet process. Hopes are entertained by many that construction will be completed soon, but no definite steps to this end have been taken. Extension of the narrowgauge railroad from the Underwood to the Flint limestone deposit would be necessary to insure a satisfactory reserve, and this extension would call for some very heavy construction, which might be obviated by installing an aerial tramway system.

The location of the various holdings are shown approximately in the accompanying sketch. The Barbee limestone deposit lies about $\frac{1}{2}$ mile from the plant and appears to be a good grade of material, but is situated too low to be economically handled by a steam shovel. The Underwood deposit lies about $2\frac{1}{2}$ miles from the plant. According to analyses made by the company, the limestone here is good quality and the amount available, according to their engineers' reports, would run the plant for possibly 3 years. The Flint deposit, which they rely on for their principal supply, outcrops along the top of the steep hills above the San Juan Cañon about $1\frac{1}{2}$ miles in a direct line from the Underwood beds. The Gabilan Peak deposits, possibly 9 miles from the plant, are largest of all; but as mentioned elsewhere, the limestone there exhibits all degrees of silicification. Little, if anything, has been done by the company in exploring these beds or analyzing the lime-

Properties of
Old Mission Portland Cement Co.
Near San Juan Bautista Cal.
Approximate Scale 1 in = 3 mi.
Data from the Company

Drawn by
C. H. Logan.



stone, and even if a large tonnage of the Gabilan beds should prove fit for cement, provision would still have to be made for transportation, partly by railroad and partly by tramway.

CHROMITE.

In the serpentine areas in the Coast Range Mountains, chromite is occasionally found. One such area which is quite extensive south and southeast of New Idria will be noted by reference to the geological map (Plate II). Within this area an abundance of chromite is found as small float, especially in the ravines and stream gravels. It does not, as far as observed by the writer, occur in any considerable masses but seems to be disseminated in boulders and small masses throughout portions of the serpentine. Centuries of weathering and erosion have concentrated this mineral in the stream gravels. About 1875 a party of four men, with teams not otherwise engaged at the time, hauled out to Hollister a carload or two of the coarser of this natural concentrate, shipped it to San Francisco and thence by sailing vessel to Baltimore. The workable deposits were so scattered, and limited in extent, and the margin of profit was so small (they did actually make a slight profit) that they discontinued the experiment.

The chromite here is characterized by specks and films of a green oxidation product. In early days this was erroneously reported as nickel and also as "hornsilver," though the color is a more vivid green than the latter mineral.

Bibl.: Rept. IV, p. 136; VI, Pt. I, p. 100; VIII, pp. 483, 490; Bull. 27, p. 126; Bull. 38, pp. 269, 362; Bull. 67, p. 81; MIN. RES. W. OF ROCKY MTS., 1868, p. 224; CAL. SEN. DOC. No. 9, 1854 (J. B. Trask), p. 18; U. S. GEOL. SURV., Bull. 603, p. 208; Mon. 13, p. 294.

CLAY.

R. W. Chappell, of Berkeley, owns an undeveloped deposit of clay on the San Justo Ranch, 3 miles south of Hollister. The clay is gray-green in color, plastic, and free from sand. It has been tested and found to be suited for pottery work. A well is said to have been drilled 80 feet entirely in this clay.

Bibl.: Bull. 38, p. 226.

COAL.

Small veins of bituminous and subbituminous coals have been observed at many places in the county. Work was done in 1878 near Emmett on a vein of "jet" about 6" wide. Mention is also made of coal on the Rancho Cienega del Gabilan. Other deposits were observed at an early date and slightly prospected on Panoche Creek, near the Fresno County border, where 3 veins, the largest said to be 4 feet thick,

occur interstratified with shale; and on the Ashurst Ranch, in the Vallecitos country. There is no record of production from any of these beds.

Mascovich Coal Mine, formerly called the Trafton Mine, is now owned by N. P. Mascovich of San Benito. It is situated in the NW. $\frac{1}{4}$ of Sec. 21, T. 17 S., R. 10 E., at an elevation of 2300 feet, near the head of James Creek. The nearest railroad point is Metz, distant 22 miles in a southwesterly direction.

It was first opened by Trafton in 1870. He drove one shaft on the vein 128 feet, but did not accomplish much in actual production, and the mine laid idle until about 1907, when the Monterey Coal Co. took it on lease. They did some work in the old shaft and sank another to a depth of 70 feet. The mine was equipped with a hoist and a steam engine which used coal from the mine for fuel. Some coal was mined, but the company was unable to make any money on the venture and the owner was compelled to take back the property. He has since sunk the shaft started by the Monterey Coal Co. to 158 feet and has driven a siphon tunnel 80 feet to drain the shaft. He allows the shaft to stand full of water in order to lessen the effect of oxidation. The track has been removed from the shaft and no work done in it since 1913.

The coal vein has an average thickness of 6 feet and has been followed on the surface for 1200 feet. It strikes N. 10° E., and dips $37\frac{1}{2}^{\circ}$ to 40° W. The relation of the associated strata is shown in the accompanying sketch. The coal is apparently of Eocene age. It compares very favorably with other coals mined in California in composition. The analysis shows 54% of fixed carbon and a heat value of 13,220 British thermal units, or 7345 calories, and comes low in the bituminous group.

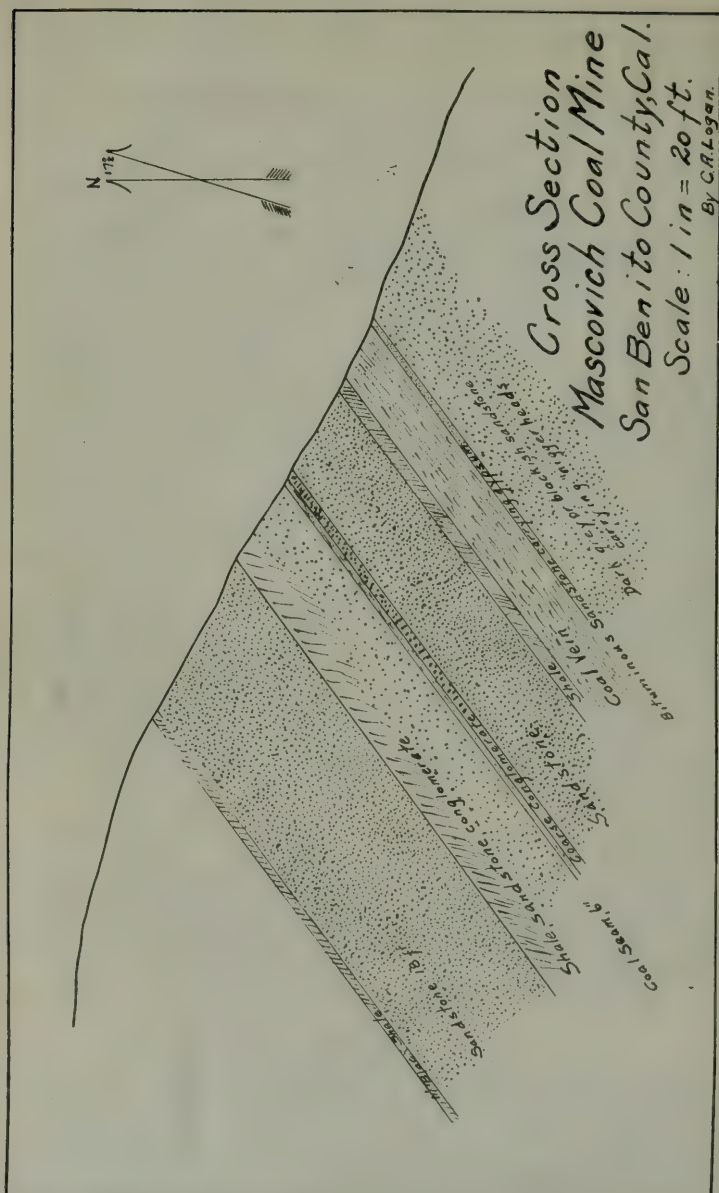
Mascovich has begun a cross-cut tunnel in the side hill below the outcrop which he figures will give 500 feet of backs when it taps the vein. The width of the vein, averaging 6 feet, should make mining cheap, and the proposed tunnel should permit of cheap handling. Lack of transportation facilities nearby have so far prevented successful operations.

Bibl.: U. S. G. S. Bull. 431, p. 243.

COPPER.

Copper indications have been found in the vicinity of The Big Pinnacles and on Lewis Creek, which forms the southern boundary of the county.

Copper Mountain Mining Company, of Salinas, Cal., has 21 lode claims, 3 mill sites, a water right, 2 dump sites and a townsite located



in Sec. 33, T. 16 S., R. 7 E., near the Monterey County line. The development consists of 40 feet of open cut 12 feet wide, in which is a lens of rock showing malachite stains and possibly some chalcopyrite. The lens showed a thickness of 18" and a length of 6'; above on the same hill to the north are 2 tunnels each 10 feet long, showing copper stains at the portals, and an open cut of 30 feet. The country rock is granitic. The property is equipped with 6 redwood tanks $3\frac{1}{2}' \times 3'$, for leaching the ore, but as far as could be learned no copper has been recovered. Idle when visited.

Lewis Creek Claim, located on the stream of that name, in Secs. 2, 3 and 4 of T. 19 S., R. 10 E., was prospected ten years ago or more by G. W. Spencer, of Hollister, and F. W. Saffel, of Lonoak. The development comprises a tunnel 100 ft. long, which missed the ledge. The outcrop was traced about 4 miles and showed chalcopyrite, with walls of sandstone and serpentine. Idle for years.

Bibl.: Bull. 23, p. 146; Bull. 50, p. 172.

DOLOMITE.

Extensive bodies of a fine quality of dolomite are found southwest of Hollister in the lower hills of the Gabilan Range. The deposits are associated with the limestones mentioned previously, and show the effects of metamorphism due to intrusions and earth movements as observed at Gabilan Peak. Since the impetus given the steel industry in the past year, a limited demand has arisen on the Pacific Coast for dolomite, which is used in making refractory basic linings in open hearth steel furnaces. Dolomite has been shipped from two properties in San Benito County to Los Angeles and San Francisco.

Baldi and Rothschild, under the name of **San Benito Quarries Co.**, 401 Front St., San Francisco, Cal., have a lease on a dolomite deposit on the O'Hara Ranch, which is 11 miles southwest of Hollister. Their quarry has an elevation of 1650 feet and is opened on the top and slopes of one of the rolling hills a few miles east of Gabilan Peak. The dolomite is quite pure, carrying very little silica and said to show 21.55% MgO. The overburden is very light, consisting of 1' to 4' of soil. The greater part of the dolomite shipped so far from this quarry was taken from the top of the knoll, where a pit 40' in diameter was opened. The dolomite was carried out in wheelbarrows and loaded on wagons, which hauled it to Hollister. During part of the past summer (1915) 10 men were employed at the quarry and 9 teams were kept busy hauling, the daily shipments averaging about 40 tons. In spite of the laborious method of mining and the low price obtained, a fair profit per ton was realized. The accompanying photograph

shows the method of tunneling into the deposit to avoid the overburden and the upper, impure part of the bed.

A. A. Haskins, of Hollister and Colma, has opened a dolomite quarry under lease on the property of the San Benito Vineyards Co., 10 miles southwest of Hollister. The opening is on a sidehill, about half a mile west of the Baldi and Rothschild holdings. It has an elevation of 1550 feet. Ascending the hill above the open cut, croppings of fairly pure dolomite occur on the slope for perhaps 300 feet, followed by a zone of metamorphic dolomite and limestones, giving way at the summit to croppings of granitic schist. Eastward, down the slope 200 feet



Dolomite Deposit, 11 miles from Hollister, San Benito County, showing method of tunneling into the deposit to avoid overburden and the impure upper portion of deposit.

below the summit, fairly pure dolomite occurs, merging rapidly into highly silicified dolomitic limestone.

Mr. Haskins has opened a cut 36 feet wide with a face 30 feet high and has gone into the hill about 40 feet. The photograph illustrates the method of working. From the car the dolomite is dumped into a chute which feeds the ore into the wagon or auto truck used for hauling to the railroad at Hollister. The light overburden, one to three feet, is removed with scrapers, and the dolomite is blasted loose after drilling with hand tools. The material is high grade, pure white and crystalline,

and carries better than 40% MgCO_3 , with an insignificant amount of silica. The deposit has been opened in such a way as to allow of very cheap mining, and a good road to Hollister favors fairly cheap hauling. Mr. Haskins has erected a small loading bin at the depot at Hollister. The material is raised to this bin by a bucket elevator and goes from the bin into the cars on the siding below. Several hundred tons were awaiting shipment there in December.



Haskins Dolomite Quarry, near Hollister, San Benito County.

On the property of **Leopold Palmtag**, adjacent to the ranch of the San Benito Vineyards Co., dolomite is reported to occur in considerable quantity, no doubt a part of the same deposit mined at the two properties above described. This dolomite had not been prospected and was not visited by the writer.

A. J. Fazzi, of Hollister (San Francisco office, No. 1017 Crocker Building), has a lease on a dolomite deposit on the E. L. Martin ranch.

8 miles southwest of Hollister. Preparations are being made (June, 1916) to ship material from this deposit. The following analysis by A. A. Hanks, San Francisco, shows it to be a high grade dolomite:

CaCO ₃	54.54%
MgCO ₃	42.78
Fe ₂ O ₃ and Al ₂ O ₃	0.80
SiO ₂	1.00
	<hr/>
	99.12%

DIATOMACEOUS EARTH.

Deposits of diatomaceous or infusorial earth have been noted in two places in the southern part of the county but have never been prospected.

On the property of the **Leonard Estate** in Sec. 28, T. 17 S., R. 8 E., adjacent to the bituminous sandstone quarry of the Topo Paving Company and also on the land held by that company, diatomaceous earth outcrops in rounded knolls for a distance of over a mile. It is considered to belong to the Monterey formation of Miocene age. There is little likelihood of any work being done on the deposit on account of its distance from the railroad, there being many deposits, notably in Santa Barbara and San Luis Obispo counties, which lie adjacent to rail or water transportation.

On the **N. D. Page** property, about one mile from San Benito, there are also some outcrops of diatomaceous earth which have never been prospected.

GEMS.

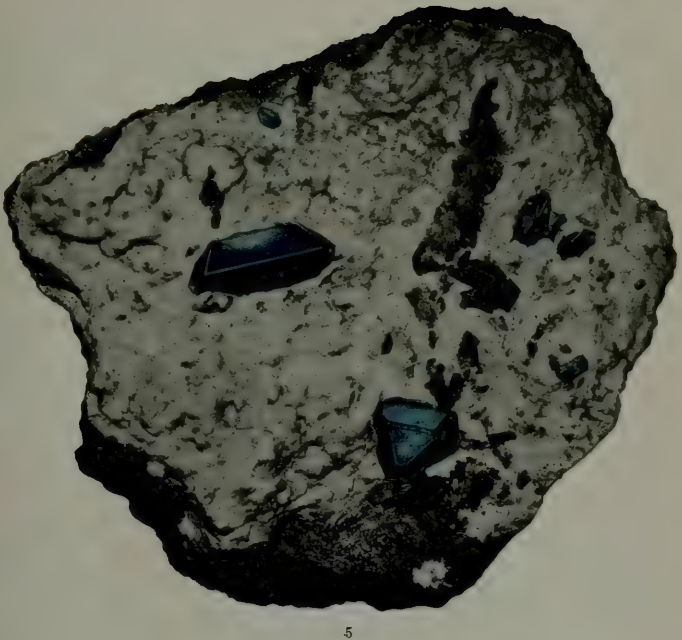
Benitoite—Dallas Mining Co., owner; R. W. Dallas, president, No. 1 Webb Bldg., Coalinga, Cal. Two patented claims in Sec. 25, T. 18 S., R. 12 E., 12 miles southeast of Idria, at an elevation of 4600 feet (U. S. G. S.). This is the only known occurrence of the gem mineral benitoite; and there is only one other known occurrence of the neptunite which accompanies it, that is, in Greenland. The deposit was discovered in 1907, and the bluestones at first thought to be sapphires; but they have been identified by Prof. G. D. Louderback,¹ as a distinctly new mineral.

Benitoite crystallizes in the rhombohedral division of the hexagonal system, in the form of prisms with trigonal pyramids. It is transparent and the color varies from colorless to deep blue, being strongly dichroic (see Plate I). The hardness is 6.5 and sp. gr. 3.64-3.65. The name was given it because of its occurrence near the head waters of the San Benito River, in San Benito County, and near a peak of the same name. "Benito" is a Spanish form of benedictus, blessed.

The benitoite (a titano-silicate of barium, BaTiSi₃O₆) occurs associated with natrolite (white—Na₂Al₂Si₃O₁₀ · 2H₂O) and neptunite

¹Bull. Dept. Geol., U. of Cal., Vol. 5, pp. 149-153.

PLATE I.



5

Benitoite.—1 and 2. Gem in ordinary reflected light, natural size; 3. in transmitted light, extraordinary ray; 4. in transmitted light, ordinary ray. 5. Crystals in matrix, $\frac{1}{10}$ nat.

(black, but in thin splinters blood-red—a titano-silicate of iron, manganese, potassium and sodium), in a zone of narrow veins in serpentine. The developments consist of two short adits and a vertical shaft 50 ft. deep, the latter having been operated with a horse-whim (see Photo No. 10). A number of the gems were cut and placed on the market, and proved quite attractive. However, the property has been allowed to lie dormant for the past five or six years, largely on account of unsatisfactory financial conditions and a slack demand for gem materials.

Bibl.: Bull. 67, p. 157; BULL. DEPT. GEOL. U. OF CAL., Vol. 5, pp. 149-153, 331-380; U. S. G. S. Bull. 603, p. 208; Min. Res. 1909, Pt. II, pp. 742-748; CENTRALBLATT FÜR MIN. GEOL. Pal., 1909, pp. 293, 592; AM. JOUR. SCI., Vol. 27, p. 398; SCIENCE, 1908, p. 616.

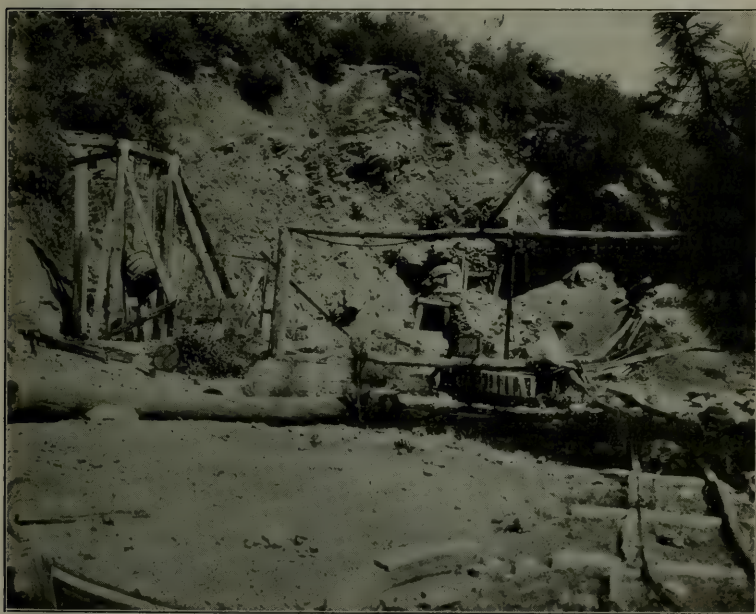


Photo No. 10. Benitoite Mine—Dallas Mining Co., San Benito County.

GOLD.

Several attempts to mine gold have been made in this county but have proven abortive, in spite of the fact that encouraging surface indications of the metal have been found in a number of districts.

In the '80's an attempt was made by a party of Frenchmen to do some placer mining in the Panoche Valley, but lack of water near by resulted in their failure to accomplish anything.

Bibl.: Rep. VIII, p. 490.

Chalone Mine and the adjacent Defiance Mine were opened by Thomas Flint, of Hollister, in 1890. They are situated on a volcanic ridge northeast of North Chalone Peak, probably in Sec. 14, T. 17 S., R. 7 E. Rock found on the surface here by a prospector assayed as high as \$94.00 per ton, and it is said that numerous samples showed over \$5 per ton. Encouraged by these showings, Mr. Flint financed the work of driving two prospect tunnels. The Chalene tunnel was driven a distance of 540 feet into the ridge about 400 feet below the summit. This tunnel is entirely in a light gray eruptive formation called liparite by former writers, being probably of rhyolitic composition and having a microcrystalline structure. Along the top of the wall is an obsidian of similar composition which shows flow structure. Mr. Flint reports that assays showed gold values of one to five dollars at several places in the tunnel, but no quantity of ore was found. There appeared no way of distinguishing barren from gold-bearing material. No faults were noted in the tunnel and the gold appeared to be a primary constituent of an unaltered igneous rock. The Defiance tunnel near by was driven about 400 feet with similarly discouraging results. The property has been abandoned and open for entry for years.

About 3 miles south of these prospects, L. H. Day, of Hollister, recently found quantities of gold in samples of andesitic rock taken from the surface.

The **San Justo Tunnel**, on the Flint Estate in San Juan Cañon, west of Hollister, was driven by Thomas Flint. Small ledges on the hill above gave samples assaying as high as \$25 to \$30 per ton of gold, but when a tunnel was driven with the intention of cutting these ledges at depth, only narrow and discontinuous stringers, carrying little or no gold value, were found. The tunnel reached a length of 300 feet and with no returns in sight, work was abandoned in 1896.

Bibl.: Reports XII, p. 227; XIII, p. 318.

GYPSUM.

Extensive gypsum beds form a conspicuous part of the Tulare sediments of Pliocene age, which mantle large areas of the country from the Topo Valley westward to the San Benito River, and southward to Lewis Creek. The deposits are mainly of the massive grey variety and are in the form of gently inclined beds, in places several hundred acres in extent, cut up by the numerous winter torrents into low residual mountains.

A number of deposits which have been worked in the past are described in the bibliography cited below. Among these are the **F. Q. Alvarez** deposit in Sec. 5, T. 19 S., R. 10 E., and Sec. 32, T. 18 S., R. 10 E., postoffice address, Bitterwater. No work recently.

Chambers Property, owned by Mrs. S. Chambers, of Bitterwater. This is located in Sec. 15, T. 18 S., R. 9 E. A very little work was done here years ago.

Bibl.: Bull. 38, p. 287.

Dunne Gypsum Quarries are located in Secs. 8 and 17, T. 18 S., R. 9 E., 13 miles from King City. J. F. Dunne, of Hollister, owner. This property has produced a large amount of gypsum in recent years, but the credit for its production went to Monterey County, as it was shipped from King City. Outcrops are visible here over two sections. The gypsum bed is covered by a soil overburden of 6' to 12', consisting of loose clayey detritus rich in gypsum, carrying gypsum pebbles and some small streaks of sandstone. Below this is a bed of massive grey gypsum, about 90% pure. The bed averages 6 feet in thickness and dips only 5° or 6° east on one side, and west on the other, indicating a gentle folding. Under this purer bed is another layer, carrying about 50% gypsum, but this has never been mined, and forms the floor in the quarry workings.

The overburden was removed with two-horse scrapers and the exposed bed was blasted with black powder, broken into blocks convenient for handling and hauled on wagons to King City, where it was shipped to Santa Cruz for use in plaster. Four teams and a small force of men were employed here until the end of 1914, when work is said to have been discontinued on account of the high cost of hauling. In the quarry last operated, a block 6' thick, 150' long and 50' wide was taken out. Another opening shows a length of 1000', a depth of 75' and a thickness of 6' removed. There are, besides, several smaller openings. Comparing these excavations with the reported production, it is at once evident that an immense tonnage has been mined here that was never credited to the county.

Bibl.: Rep. XIII, p. 504; Bull. 38, p. 287.

J. C. Tully, of Bitterwater, owns land adjacent to the Alvarez deposit, on which gypsum of similar character occurs. No work has been reported.

R. R. Tully, of Bitterwater, owns some gypsum beds in Sec. 11, T. 18 S., R. 10 E.

IRON.

The old **Quilty Iron Mine** in Sec. 6, T. 15 S., R. 6 E., two miles south of the old lime kilns of the Cienega Lime Co., was slightly prospected 15 years ago or more, but no work has been done lately. There are said to be extensive croppings of hematite on the property. It is situated about 15 miles from the railroad, Tres Pinos being the nearest station. Mrs. Quilty, Tassajara Springs, and J. S. Hawkins, Hollister, owners.

Surface indications, but no ore in place, are mentioned as having been noted on the **Williams Estate**, T. 17 S., R. 12 E., and in the country between Stayton and Panoche Pass.

Bibl.: R. VIII, p. 490; Bull. 38, p. 299.

LIME and LIMESTONE.

Limestone suited for cement making and for burning occurs prominently along the Gabilan Range from San Juan Bautista to the region of Pine Rock. Some lime has been made for local use in several places in the region, but at present there is no production, nor has there been any for a period of about 8 years. Since the last report was prepared by this Bureau on San Benito County, a number of limestone properties have changed hands. Deposits formerly owned by M. Barbee, S. Lavagnino and A. F. Underwood, of San Juan Bautista, and Thomas Flint, of Hollister, are now held by the Old Mission Portland Cement Co. More detailed mention of these properties is made under the section on Cement, in connection with a description of this company's other holdings.

Archer Lime Co. D. McPhail, Hollister, Cal., secretary. The property consists of 245 acres of land 14 miles southeast of Tres Pinos station, in Secs. 23 and 13, T. 14 S., R. 5 E. There are bold croppings of limestone here, standing up possibly 70 feet in places above the base. Mr. McPhail states that he has various analyses showing 96% CaCO_3 and 2½% to 4% MgCO_3 . The property has been mentioned favorably by engineers and no doubt contains an extremely large tonnage of good grade limestone, but has never been exploited as yet.

Connelly and Kruse limestone deposits, known also as the San Benito Lime Co., owned by Geo. Connelly and J. H. Kruse, 23d and Shotwell Sts., San Francisco, Cal., are situated in Sec. 23, T. 14 S., R. 5 E., adjacent to the property of the Archer Lime Co. There are in all 240 acres of land, on parts of which a good quality of limestone occurs. There is an old kiln of 50-ton capacity on the land, and years ago some good lime was made here, but no production has been reported for a long time.

Henry Cowell Lime and Cement Co., of No. 2 Market St., San Francisco, Cal., (with which is associated the Holmes Lime Co.) owns 1044 acres of land containing extensive limestone deposits, in Secs. 28, 29, 30 and 32, T. 14 S., R. 6 E., and Secs. 14 and 24, T. 14 S., R. 5 E., 13 miles from Tres Pinos, in the vicinity of Thompson Creek. About 16 years ago the Cienega Lime Co. operated 4 kilns of 50-barrel capacity each on this property, and burned considerable lime, which was hauled to Tres



Gabilan or Fremont Peak. This peak, and the adjacent ones, are composed largely of metamorphic limestones. Photo by S. D. Leman.

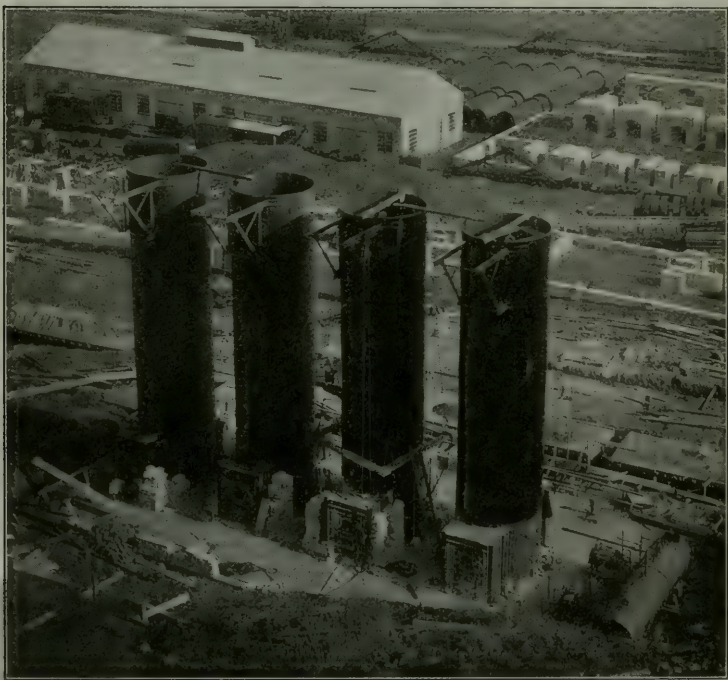
Pinos for shipment. Since the present owners came into possession no production has been reported.

Bibl.: Reports VIII, p. 488; XI, p. 370; XII, p. 393; XIII, p. 629; Bull. 38, p. 76.

U. G. Harlan et al., of Hollister, own 320 acres in Secs. 23 and 24, T. 14 S., R. 5 E., 13 miles southwest of Tres Pinos on which lime was burned up to about 8 years ago. Since that time the kiln is reported to have lain idle.

Bibl.: Bull. 38, p. 76.

Old Mission Portland Cement Co., of San Juan Bautista, owns the only modern lime kilns in the county. The plant was erected in 1913 in conjunction with the cement manufactory. At that time it was planned to supply limestone for burning from the same quarries which



Lime kilns, Old Mission Portland Cement Co.'s plant, San Juan Bautista, California.
Photo by S. D. Leman.

were to furnish the material for cement. The failure to complete the cement plant and begin quarrying operations left the lime kilns without any material to work on, and they have so far made no production, only a ton or so of rock having been burned in one kiln for a test.

There are four continuous system kilns of 75 barrels per day capacity each, housed in a galvanized building. Burning is to be done with crude oil fuel. A 15-h.p. steam boiler is installed and will be used to keep up pressure on the oil feed. If the narrowguage railroad were in operation to the limestone deposits, it ought to be possible to burn lime and put it on the market cheaply from this plant, as transportation to the main line of the Southern Pacific is already provided for by the company's own line of broadguage railroad.

MAGNESITE.

Sampson Magnesite Lode Claims. This group of claims covers a deposit of magnesite on the west slope of Sampson Peak, in Sec. 15, T. 17 S., R. 11 E., 3 miles south of west from Idria; elevation 3900 feet (U. S. G. S.). Hugo Fischl and Ralph H. Moore, First National Bank Bldg., San Francisco, Cal., are owners. It is 60 miles from the railroad at Tres Pinos on the north, and 45 miles from Mendota on the east. The deposit is indicated by a massive outcrop on the point of a ridge running westerly from Sampson Peak down to Larious Creek (see Photo No. 13.) The light spots in the distance on the opposite side of the cañon from the magnesite are bare patches of serpentine. This deposit was first described by H. S. Gale.² It is within the extensive serpentine area already noted under Chromite (see geological map, Plate II).³

At the time of the writer's visit (September, 1914), development consisted of three adits of 100', 100', and 50', respectively, also several short prospect holes; but only the upper adit showed magnesite in place. The dump of this adit can be seen in the photograph, on the south slope of the ridge a short distance below the main outcrop. Magnesite boulders and what look like small outcrops are abundant along the ridge down to the creek bottom, but from the lack of showing in the two lower tunnels it appears that the boulders are very likely float from the main mass above. Further development work will have to be done to prove if the main outcrop is simply a blanket mass on top of the ridge, or is the outcrop of a vein which continues with depth. The quality of the magnesite is good, as may be noted from the following analysis

²U. S. G. S., Min. Res. 1911, Pt. II, p. 1120.

³Since the above was written, we are informed by the owners that a large body of magnesite containing about 4% to 6% of iron has been found on the opposite side of Larious Creek.

made in the laboratory of the U. S. Geological Survey and taken from Gale's second report on the deposit.⁴

Analyses of Magnesite from Sampson Lode.

	No. 1 (per cent)	No. 2 (per cent)	No. 3 (per cent)	No. 4 (per cent)
SiO ₂	0.14	0.81	11.68	2.50
Al ₂ O ₃ .....	.48	.00	.55	.13
Fe ₂ O ₃ .....	.59	.52	.61	.44
CaO	47.07	1.04	.60	.34
MgO	50.60	46.97	41.38	41.60
CO ₂	50.60	50.60	45.26	34.89
Undetermined	1.06	.36	.52	20.10
Loss on ignition.....	100.00	100.00	100.00	100.00
		51.43	46.10	54.10

No. 1. A single block from main exposure.

No. 2. Average material from 12 samples from various points on main outcrop.

No. 3. Outcrop of magnesite from iron-stained siliceous veins on west side of Larious Creek.

No. 4. Hydromagnesite.

The bare patches of serpentine which are, in part, loose slide material and considerably weathered, are characterized by a white, powdery hydromagnesite disseminated throughout the mass in specks and small, rounded balls. The analysis of this mineral is given as No. 4 in the table. It effervesces readily and is soluble in cold hydrochloric acid.

The main economic drawback to utilization of these deposits at the present time is their distance from railroad transportation.

Bibl.: U. S. G. S. MIN. RES. 1911. Pt. II, p. 1120; Bull. 355, p. 38;

Bull. 540, pp. 503-509; Bull. 603, p. 208.

MANGANESE.

Several outcrops of manganese have been reported along the mountains near the Merced County line, but there has been only a little work done on one deposit in this region.

On the **Fries Estate**, in Secs. 5 and 8, T. 13 S., R. 8 E., 18 miles east of Tres Pinos, bold croppings of manganese oxides associated with chert are said to occur. Little is known about the amount of ore available, as no work has been done on the prospect. The writer did not visit this prospect. Mrs. Fries, Sr., and Peter Fries, Tres Pinos, owners.

Hendricks Mine, owned by N. C. Briggs and others, of Hollister, is in Sec. 24, T. 13 S., R. 8 E., 21 miles east of Tres Pinos. The holdings comprise 80 acres on which bunches of manganese oxides occur as part of prominent strata, forming the tops of the Diablo Range. Years ago ten tons of manganese ore were taken from the surface of this deposit and shipped to a glass manufactory in St. Louis. It was pronounced

⁴U. S. G. S., Bull. 540, pp. 507, 508.

very desirable and is said to have assayed 60% Mn. Cost of delivery to railroad prevented further work.

Bibl.: Bull. 38, p. 336.

William Lewis, of Tres Pinos, owns property 19 miles east of that town, adjacent to the Fries Estate, in Sec. 7, T. 13 S., R. 8 E., on which outcrops of manganese similar in mode of occurrence and quality to that on the Fries Ranch are found. No work whatever has been done there.

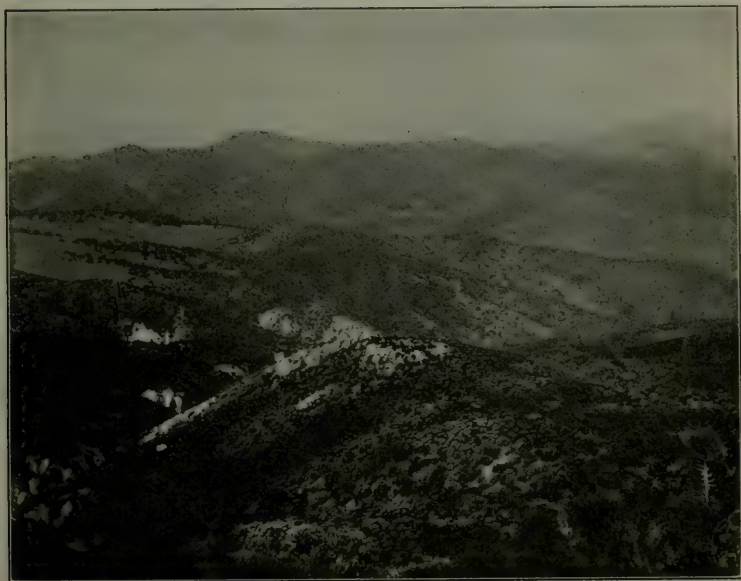


Photo No. 13. Magnesite outcrop of Sampson Magnesite Lode Claims, San Benito County—from southeast.

MINERAL WATER.

San Benito Mineral Spring Co. E. J. Anderson, owner, Hollister, Cal. This company markets annually a small production of mineral water obtained from a well about 4 miles southeast of Hollister. The well, which is 286 feet deep, was drilled in about 1890. Water rose to a point 100 feet below the surface, from which depth it has to be pumped. The analysis made by M. E. Jaffa shows a large amount of the sulphate radicle, which gives the water definite medicinal effects. It is sold artificially carbonated.

Analysis of Water from San Benito Mineral Well.

Analyst, M. E. Jaffa.

	Parts per million
Sodium -----	} 780
Potassium -----	
Calcium -----	
Magnesium -----	
Iron -----	8.9
Sulphate radicle -----	736
Chloride -----	166
Carbonate -----	178
Silica, organic matter, chemically combined H ₂ O -----	188

Bibl.: U. S. G. S., W. S. Paper 338, p. 306; STATE MINING BUREAU,
R. XIII, p. 319.

PETROLEUM.

Many wells have been drilled in search of oil in the southern part of the county, and along the southeastern portion, adjacent to the Coalinga field. Five wells driven by the Standard Oil Co. in and near the Topo Valley failed to give more than a trace of oil. The chances of finding paying quantities of oil in this region have been discussed by several writers, whose consensus of opinion is that geological conditions do not justify the assumption that an oil reservoir of any size can be there. The same observation applies to the southern portion of the San Benito Valley.

Conditions for the occurrence of oil in quantity in the country, from New Idria north to Little Panoche Creek are considered much more favorable. While investigation has led to the conclusion that the district as a whole does not promise to be an extension of the Coalinga field, certain areas seem to hold possibilities of production with proper development. One of these areas not yet thoroughly tested lies north of San Carlos Creek, near Twomey Creek; another lies just west of Silver Creek in the northwestern part of T. 17 S., R. 12 E. Good seepages of oil have been found in several places along the south side of the two forks of the Vallecitos, notably in Secs. 6, 8, 16, and 24, T. 17 S., R. 11 E. Test wells in this region have not thoroughly prospected the oil bearing strata.

The subject of petroleum in California has been freely discussed in recent years by geologists of the California State Mining Bureau and the United States Geological Survey. It is therefore not considered necessary to dwell at length on the subject in this paper, the reader being referred to the publications noted below for more detailed information.

Bibl.: Rep. XII, pp. 356, 493; Bull. 19, p. 148; Bull. 69; U. S. G. S. Bull. 431; Bull. 581 D; Bull. 603; Monograph 13.

QUICKSILVER.

San Benito County ranks among the oldest and most important quicksilver producing counties in California. It contains the New Idria mine, which stands second only to the New Almaden mine, both in length of continuous operations and in point of total production to date. In fact, since the decline of the latter mine from its former importance,



Photo No. 14. A shipment of 300 flasks of quicksilver from the New Idria Mine, San Benito County.

the New Idria for some years past has been the largest single producer of quicksilver in the state. The total recorded yield of San Benito County to the end of 1915 has been 296,899 flasks, valued at \$14,551,450.

There are three quicksilver districts in the county, all situated in the Diablo Range, which traverses the eastern part of the county in a northwest-southeast direction. The Stayton district is at the northern

end at the junction of San Benito, Santa Clara, and Merced counties. The New Idria district is in the southeast corner of San Benito County; and the third district, in which are the old Cerro Benito and Bradford mines, is situated between the other two. Only the New Idria district has been active recently, or has ever produced quicksilver to any notable extent, the others having been idle for many years.

The cinnabar ores of the Stayton district are characterized by associated stibnite. The general geology of this region, with particular reference to the quicksilver deposits, has been described in considerable detail by G. F. Becker⁵ and Wm. Forstner,⁶ so will not be repeated here, as but little additional detail has since been developed. The most recent geologic map of this part of California is that accompanying the report of R. Anderson and R. W. Paack⁷ on the oil possibilities of the region, and from which we have prepared the map presented herewith (Plate II), with some minor additions from our own observations.

Considerable activity is being manifested at the present writing (March, 1916), throughout the quicksilver districts of the state, on account of the high price of this metal, resulting from the war in Europe. It has risen from a figure approximating \$37.00 per flask, in July, 1914, to \$300.00 per flask in February, 1916. Though the future is still uncertain—as long as the war lasts the price may go still higher, and it certainly will go down when peace is declared, if not before—yet, quicksilver will probably not again reach as low a value as in 1914 for some years to come. One item that would help to improve the domestic situation, is an increase in the tariff on imports. This would protect us against excessive shipments of Spanish and Austrian quicksilver, where labor especially is so much cheaper than in the western United States.

There have been practically no improvements in the metallurgy of quicksilver since Robert Scott in 1871 developed the fine-ore tile furnace, until the present attempts to apply concentration to some of our low-grade ores. These were briefly described by the writer,⁸ as far as observed at certain mines in Napa and Colusa counties. An experimental plant is now in operation at the New Idria mine (*q. v.*) in this county. The State Mining Bureau is making a thorough investigation, including mill tests, to determine as far as possible the scope and value of concentration for quicksilver ores, both containing native mercury and cinnabar, including also the application of flotation to the recovery of slime cinnabar.

⁵U. S. G. S., Monograph XIII, "Geology of the Quicksilver Deposits of the Pacific Slope," 1888.

⁶State Mining Bureau, Bull. 27, "Quicksilver Resources of California," 1903.

⁷U. S. G. S., Bull. 603, "Geology and Oil Resources of the West Border of the San Joaquin Valley," 1915.

⁸State Mining Bureau, "Mines and Mineral Resources of Colusa, etc.," by Walter W. Bradley, 1915, pp. 18, 55-56, 111-113, 118.

GEOLOGIC MAP OF NEW IDRIA DISTRICT SAN BENITO CO., CAL.

Scale of miles.



(After U.S.G.S. with additions by the authors.)

LEGEND

Tej Etchegoin or Jacalitos	Tk Kreyen- hagen shale	Tm Martinez	Km Moreno	Jf Franciscan
TV Vaqueros	Ttj Tejon	Tmc (with Cantua sandstone)	Kp Panoche	S Serpentine

1916



Alpine Quicksilver Mining Co., formerly called the Esmeralda Quicksilver Mining Co., H. B. Leonard, San Benito, Cal., manager; D. McPhail, Hollister, Cal., secretary. The company owns 32 full claims in Secs. 13 and 14, T. 18 S., R. 11 E., 6 miles from Hernandez and 40 miles from Coalinga, the nearest railroad point.

These claims occupy the southwestern portion of the zone of highly metamorphosed, silicified serpentine which extends from the creek just east of Los Picachos Peak, to the old Clear Creek and Boston mines in Sec. 2, T. 18 S., R. 11 E. They have a total length of about $1\frac{1}{2}$ miles along the strike of the outcrop zone and join the Monterey Group on the northeast. The original discovery was made by Silvester Tirado, who sold the early holdings to the present company about six years ago.

They have since made additional locations. The surface outcrop is ocherous and highly silicified, but as one descends into the mine the serpentine shows less and less alteration. A slip at the discovery point strikes S. 20° E., with a dip of 70° NE. Ore so far mined has been taken out in bunches along the locus of this slip for an inclined depth of 190 feet, along which the slickensided wall can be easily traced. The width of ore at the outcrop was about two feet. No surface work has been done to determine the extent of mineralization along the strike. The older work was carried on through a tunnel 150 feet long from which an inclined raise at an angle of about 45° followed the mineralized fault locus 100 feet to the upper tunnel, which was only a few feet long. Small stopes along the raise yielded some good ore which was treated in "D" retorts and pipe retorts, giving a nominal output. A small stope was also driven off the lower tunnel and a 15-foot drift from the raise between the levels, but the latter did not uncover ore. Later work has gone on through a new tunnel, which had been connected with the next level above by an inclined raise of 90 feet and which is 230 feet on the incline below the outcrop. At the time of our visit this had been driven 800 feet in an endeavor to cut the "vein" at depth, but was in serpentine the entire distance. This showed minor fractures filled with silica and calcite, but only small traces of cinnabar. Two crosscuts, driven 45 and 75 feet respectively, off this level, failed to show ore. Work had started on a stope four sets wide off the middle level (the old lower tunnel). This had entered a mineralized lens and had been carried 15 feet without having passed out of ore. The cinnabar made in a chalcedonic gangue varying in color from light to black, and also in the fractured serpentine with a gangue of silica and calcite, in narrow stringers. Hand specimens show bunches of grey and greenish chalcedony carrying cinnabar, associated with lumps of magnesite, through which tiny specks of cinnabar are sprinkled. Considerable native mercury in serpentine was also noted in this stope. This ore was of furnace grade, and in spots rich enough to retort. The writer also

observed a few tons of ore on the new dump, which could be handled in the furnace after drying.

The reduction plant formerly used, and still in order, consists of 8 "D" retorts and 2 pipe retorts, with 6 other pipe retorts which have been burnt by using too hot a fire. The new plant, which was being built when visited, in December, 1915, includes an improved Scott furnace of 20 tons capacity, and four brick condensers. The bricks were burned at a clay bed on the stream four miles from the mine, and heavy work was encountered in hauling them to the furnace site. This dis-



Photo No. 15. New 20-ton Scott furnace, Alpine Quicksilver Mine, San Benito County.

trict is handicapped by having roads which become nearly impassable after a rain, and mining development is bound to be retarded by the difficulty and cost of transportation. The furnace is located at an elevation of 3730 feet (barometric reading). The country is entirely serpentine, with the characteristic sparse growth of brush and only

scattered pine timber. The company will obtain its timber from its own land and pine wood for fuel will be cut near by, at a cost of \$8.00 to \$9.00 a cord, delivered.

Andy Johnson Mine. (See Flint Group.)

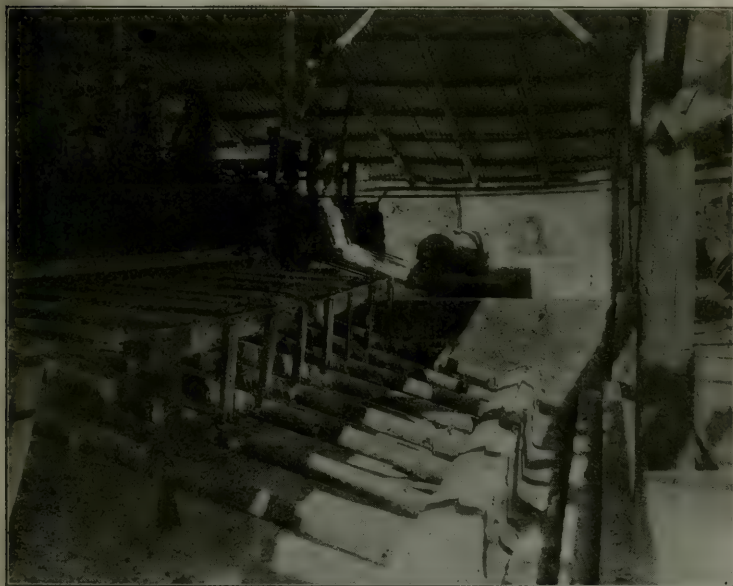


Photo No. 16. Condensing pipes of quicksilver retorts at the Alpine Mine, San Benito County.

Aurora Group (one time called **Morning Star**), and **Monterey Group**, owned by the Esmeralda Quicksilver Mining Co., Richard Phelan, president; R. W. Gilloghy, secretary; H. T. Hays, engineer; office, 942 Phelan Bldg., San Francisco, Cal. The Aurora Group consists of 38 claims, mainly in Sec. 12, but extending into Secs. 11, 13 and 14, T. 18 S., R. 11 E., 5 miles southeast of Idria, and just north of the Alpine mine. Both groups are within the serpentine area. Only a small amount of development work has been done on the Monterey, which it is stated will be equipped and worked in conjunction with the Aurora. In the latter the principal development is an adit, in between 300' and 400', and a raise connecting with the surface, where there are several open cuts. The cinnabar occurs in a vein-filling of chalcedonic silica dark green to white in color. The croppings have a course of S. 15° E. Though said to have been discovered in 1853, it has been worked only at irregular intervals. In 1911 a revolving furnace, similar to a cement

kiln (see Photo No. 17), was installed, but owing to mechanical difficulties it was operated only one day. The flue connections leading to the condensers can be seen at the upper end. In October, 1915, the furnace was repaired and refitted, and operated for a few weeks, until severe winter storms damaged the roads from Mendota, cutting off the supply of fuel oil. Operations will be resumed this spring (1916). The capacity is 50 tons per day. During these latest operations, ore was quarried from the outcrop.

Bibl.: Bull. 27, p. 131; MIN. RES. W. OF ROCKY MTS., 1874, p. 381; U. S. G. S. Mon. XIII, pp. 309, 466; Min. Res. 1914, Pt. I, p. 326.



Photo No. 17. Rotary furnace, Aurora Quicksilver Mine, San Benito County.

Benta Group, situated in Secs. 20 and 29, T. 18 S., R. 12 E., were located in 1913 by M. G. Ramirez and S. Tirado, of Hernandez. There are two claims in the group, which joins the Ramirez or Los Picachos claims on the southwest. The claims are on the same series of highly siliceous croppings which show so prominently on the Ramirez property, but the serpentine appears less silicified. Only the annual assessment work consisting of 2 open cuts 10 feet each, has been done so far. A little cinnabar has been found, occurring in tiny veinlets with silica in the serpentine fractures. In Monterey National Forest, reached only by trail.

The **Bonanza Group** is another newly located quicksilver property. M. G. Ramirez and Ramon Tirado, of Hernandez, made locations here on two claims, naming them the Bonanza 1 and 2, in the winter of 1913. There is no variation in geology from the other properties near by, except that these claims are a little away from the line of croppings and exhibit a less highly silicified serpentine. They lie just southwest of the Benta claims, in Sec. 29, T. 18 S., R. 12 E., in the Monterey National Forest and are accessible only by trail, a distance of $2\frac{1}{2}$ miles from the Florence Mack, or 5 miles southeast of the Alpine Mine. Prospecting work consisting of a 10-ft. tunnel has been done, but no cinnabar had been revealed at the time of the writer's visit.

Boston Mine. (See Flint Group.)

Bradford Mine, in Secs. 3, 4 and 9, T. 15 S., R. 8 E., has been idle for years. The property was fully described in the below noted report and there has been no work of any interest since that report was published.

Bibl.: Bull. 27, p. 131.

Butts Mine, Wm. Butts, Pine Rock, San Benito County, owner; Geo. Kline, Pine Rock, lessee. Located in Sec. 4, T. 16 S., R. 8 E., 21 miles south of Tres Pinos. The old workings of this mine, which have been abandoned for years, and which never yielded any mercury to speak of, were described by Forstner in Bull. 27. The new workings, which are now yielding some mercury, are located about $\frac{1}{4}$ mile north of the old mine. An open cut and tunnel totalling 75 feet, driven some time ago by Kline, in which it is reported that good ore was found, have caved in. A tunnel and open cut totalling 60 feet has been driven above this caved ground and about 20 feet below the outcrop. This has cut diagonally across a chert and sandstone breccia which carries ore for a width of about 18 inches. Cinnabar and metacinnabarite occur in the cementing material of the breccia with a calcite gangue. The work done is not sufficient to show conclusively that the deposit is in place and there is only one outcrop of the cinnabar-bearing breccia, but the strike of 35° northwest and dip of about 60° northeast (as closely as they can be measured in the shallow workings) agree with the general run of the country rocks and appear to confirm the supposition that the deposit is in place and not fragmental. The claim is at an elevation of about 2300 feet, with sandstone and shale country rock and metamorphics derived from these sediments.

Reduction is carried on in a "D" retort. Two men were employed during the summer. One man recently produced a flask of mercury in 19 days, working alone and carrying the ore on his back some distance to the retort.

Bibl.: Bull. 27, p. 133.

Cannon Mine, in Sec. 4, T. 15 S., R. 8 E., adjacent to the Bradford, and 18 miles from Tres Pinos, has been idle since the Bureau's last report.

Bibl.: Bull. 27, p. 133.

Cerro Benito Mine, owned by Thos. Flint, of Hollister, and situated in Sec. 31, T. 15 S., R. 10 E., 35 miles southeast of Tres Pinos, was one of the first mines opened in the county. A Knox and Osborn furnace was in operation here previous to 1874, and production up to 1876 is said to have been about 800 flasks. The mine showed little activity after that until about 1902, when some work rebuilding the furnace and reopening the tunnel was done; but no production since then has been reported. The geology of the property and the extent of the workings were so well covered in the first reference cited below, that there is no reason for covering these details in the present paper.

Bibl.: Bull. 27, p. 134; MINERAL RESOURCES WEST OF ROCKY MTS., 1875, p. 14.

Clear Creek Mine. (See Flint Group.)

Don Juan and Don Miguel Mines in Sec. 36, T. 18 S., R. 11 E., and Sec. 31, T. 18 S., R. 12 E., have been dead for years and showed no sign of activity when field work for this report was done.

Bibl.: Bull. 27, p. 138.

Flint Group, owned by Thos. Flint, of Hollister, comprises the old mines known as the Andy Johnson, Boston, Fourth of July, and Clear Creek, and consists of 552 acres of patented land in Secs. 2, 11, 12 and 13, T. 18 S., R. 11 E., and Sec. 18, T. 18 S., R. 12 E. The Clear Creek, Boston, and Andy Johnson occupy the northwestern portion of the prominent zone of ocherous, silicified croppings which strike northwest from the Hernandez (Los Picachos) mine. They lie adjacent to Clear Creek, taking in the hills to an elevation of about 3700 feet (barometric reading) and 600 feet above the creek. The Andy Johnson claim adjoins the recently located Capitola on the southeast, where some very rich surface ore is being retorted. These properties have been idle so long that definite data concerning them is not obtainable. The Andy Johnson, according to Mr. Flint, was worked by an open cut and was noted for the amount of native mercury yielded, as much as a pint being taken at times from one spot. The Clear Creek mine was operated through a tunnel 600 feet long, from which underground operations on rather an extensive scale revealed good ore. All these workings caved in years ago. A furnace for reducing the ore was operated on the bank of Clear Creek, near the junction of the Alpine and New Idria roads, but this also has long since fallen to ruin, and definite information concerning the output of mercury from it is not to be had. The mines were closed in the early eighties when the price of quicksilver was so

low as to practically prohibit mining. It is believed that considerable good ore remains in these properties. Most of the ground has not been thoroughly explored, and in view of the good showings of ore in other near by mines on the same series of outcroppings, it appears as though thorough prospecting would be justified on these holdings. The country is mantled by serpentine in deeply disintegrated and rounded knolls, carrying little vegetation except along the little watercourses. A fairly good road reaches the mines from Hernandez, 5 miles distant.

Bibl.: Bull. 27, pp. 131, 137, 138.

Florence Mack Mine. C. P. and Florence Smith, of Hernandez, and S. and D. D. Hogue, of Hanford, locators; G. W. Warner and S. M. Suffron, Paso Robles, lessees. The holdings consist of 6 full claims, with a total length of 6000 feet, in Sec. 32, T. 18 S., R. 12 E., on Saw Mill Creek, 7 miles from Hernandez and 30 miles from Coalinga, about one mile from the main highway joining Hollister and the latter town.

The development of the property was done largely by a Mr. Courtney, of Hanford, who prospected the property under bond in 1904 and the following years. The mineralized zone strikes northwest and dips 40° to 45° SW. The tunnels and crosseuts show a stratum of black clay shale or "mudrock" about two feet wide, carrying cinnabar values near the footwall, which is a fine-grained indurated sandstone or shale. This belt is cut by numerous pyrite stringers, carrying considerable cinnabar. There are three tunnels on each side of the creek, but the work was done mostly on the left or northwest side.

The lower and chief tunnel on this side enters the hill almost east and west. Near the portal the first crosscut north about 40 feet shows no ore. About 50 feet from the portal this tunnel branches, the chief working running 20° west of north. A crosscut 125 feet long east and west shows stringers of small size, striking north and south and carrying cinnabar. One hundred feet from the portal a crosscut 45 feet long was driven to follow a highly pyritized zone one foot wide striking northwest. Pyrite stringers about 2" wide, nearly solid, occur here, giving out, however, at a length of 6' to 8'. They carry good quantities of cinnabar. Fair ore in the vein was struck in this tunnel at a distance of 154 feet, and was followed to a shaft, 50 feet farther. This shaft and the tunnel, at a distance of 50 feet beyond the shaft, were inaccessible and efflorescences on the tunnel sides obscured observation. The present lessee was unable to give the length driven in the tunnel or the depth of shaft.

The second tunnel runs N. 20° E., 100 feet. It shows mudrock, 2 feet wide, carrying cinnabar near the footwall. A crosscut 20 feet southwest follows FeS₂ stringers 1" wide carrying cinnabar. The main crosscut runs 120 feet NW.-SE. and at its end is a small hole cut down on the

vein; a 20' branch crosscut connects with the raise from the lower tunnel, 60 feet below.

The upper tunnel is 40 feet above the second and 50 yards west. It is a crosscut tunnel, exposing at the breast the same 2' stratum of black clay shale, but no cinnabar is in evidence.

There is a large tonnage of low-grade ore on the dump at this mine, which has been lying for some time and should prove susceptible to concentration. A considerable portion of it would make furnace ore. The lessees plan to concentrate it in sluices. The sedimentary country rocks and the nature of the vein filling distinguish the mine from those 2 miles or more north. It is completely outside the serpentine belt. The

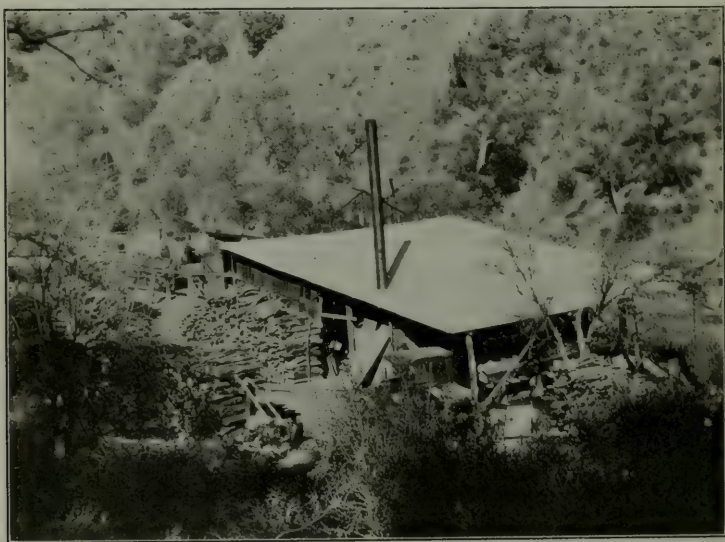


Photo No. 18. Retort plant, Florence Mack Quicksilver Mine, San Benito County.

old tunnels south of the creek were short and appear to have been driven too high. The vein crosses the creek and has been exposed on the south-east side by a short tunnel driven by the present lessees; one of the old tunnels, driven in 1906 scarcely 10 feet above and to the left of the new opening, failed completely to uncover ore.

A force of 7 men was employed in December, 1915. A 12-pipe retort plant, with a daily capacity of 250 lbs. of ore per pipe, had just been completed and the first charges of ore were being treated when the writer visited the mine. It was observed that no water had been provided to cool the exit pipes, and the fire seemed to be too hot for good recovery. The ore is highly pyritiferous and so requires great care to

avoid roasting it too hot. The lessees were inclined to believe that arsenopyrite was responsible for their failure to recover much mercury; but an examination of some of the ore in the laboratory of the State Mining Bureau failed to reveal any arsenic sulphide. While the ore uncovered at that time was scarcely high-grade enough to retort profitably without concentration, the operators would probably get better results if they had a supply of water to cool the condensing pipes, and used a slower fire.

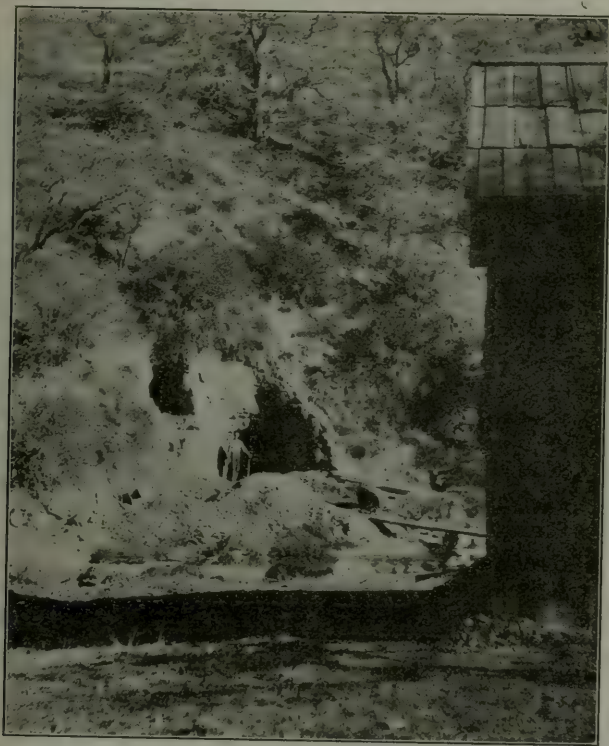


Photo No. 19. Old and new prospect tunnels, Florence Mack Quicksilver Mine. The old (upper) tunnel was a few feet too high and failed to uncover the vein; the lower tunnel showed a fair prospect of cinnabar.

Fourth of July Mine. (See Flint Group.)

French Ranch, H. French, Hollister, owner, now embraces the old properties formerly known as the **Santa Cruz** and **Mariposa Mines**, in Secs. 20, 21, 28 and 29, T. 11 S., R. 7 E. Some surface indications of cinnabar here caused prospecting in the seventies, but a little work revealed the fact that the cinnabar did not persist, and stibnite was

found to be the principal mineral. For further mention of the district, see the discussion on Antimony in this report.

Bibl.: Rep. XII, p. 365; Bull. 27, p. 147.

Hernandez Quicksilver Mining Co., known also as **Los Picachos**, or the **Ramirez Consolidated**; M. G. Ramirez, San Juan Bautista, manager; Silvester Tirado, Hernandez, superintendent. Six patented claims form the group. They lie in Secs. 19 and 20, T. 18 S., R. 12 E., and are accessible only by trail, being 5 miles from the Alpine and 2 miles north of the Florence Mack. The elevation of the new furnace is about 4780 feet (aneroid). Through this property, striking northwest and extending to the northern end of the Flint Group, 5 miles distant, is a wide and prominent mineralized zone, revealed on the surface by deeply altered, bold, siliceous outcroppings, stained a rusty color by the iron present. The softer parts of this rock have been weathered out, leaving a metamorphic composed principally now of silica, showing in different places a great number of phases—chalcedony, quartz, flint, and agate. At the Hernandez this zone of croppings is nearly $\frac{1}{2}$ mile wide, ending abruptly about 1500 feet southeast of the furnace.

The mine was opened in the days of the old quicksilver boom by a tunnel driven northward from the southern slope a distance of 3000 feet, designed to cut the ore exposed in the outcrop at depth. As far as can be learned, this work never led to any appreciable production. In later years operations have been confined to the exploration of the outcrop near the surface in the southeastern part of the holdings, although there are other prospects of cinnabar in the mile of outcrops embraced in the claims, which would seem to warrant prospecting. The present company has been in possession since 1904, but work has been desultory and actual progress in development almost negligible. For about four years past, a small yearly production of metal has been made in a bench of four pipe retorts. The ore has come from the southern and eastern sides of the outcrop near the surface. Inclined shafts, one of 160 feet and two of 50 feet each, have been driven, besides which some rich ore has been taken from the face of the outcrop. The bluffs at the furnace face southwest and stand up about 100 feet above the furnace, showing cinnabar in many places. The ore being treated at the time of the writer's visit came partly from an incline about 45 feet deep. This had been sunk on a lens of ore which had a thickness of about 3 feet, a width of 40 feet and had been worked out 50 feet along the strike. The shoot struck N. 35° W., with a dip 50° to 60° NE., and appeared to be about 100 feet long on the strike, judging by the shape of the portion mined. In this lens cinnabar had been deposited in various ways. It occurs with stringers of pyrite, apparently occupying minor fissures; it is also seen as a coating in fracture planes. The most characteristic occurrence, however, is where a layer of cinnabar about

$\frac{1}{8}$ " thick, in association with pyrite, had been deposited from solution on the main fissure wall; superimposed on this and indicating a second period of deposition was a layer of silica crystals of equal thickness. The ore from this lens had yielded as high as 150 pounds of mercury per ton.



Photo No. 20. Characteristic outcrops; Los Picachos Peak, Hernandez Quicksilver Mine, San Benito County, California.

A fine-ore furnace of 4 tons capacity with 2 brick condensers had just been finished but had not yet been tested. It was expected to burn about as much fuel as a bench of 12 pipe retorts, with much greater capacity. The district north and east is sparsely timbered and watered, being mantled by serpentine, but there is a fair growth of timber to the south, outside the serpentine belt. Dry wood for fuel costs \$3.00 to \$4.00 per cord. In the summer 5 men are employed.

Bibl.: Bull. 27, p. 145; GEOL. SURV. OF CAL. (Whitney), Geol. Vol. II, p. 121.

Lone Star Mine, Geo. Wapple, Hollister, owner; Judge M. T. Dooling and M. Forcade, Tres Pinos, lessees. Located in the Rancho Real de las Aguilas, 18 miles southeast of Tres Pinos, near Los Muertos Creek. A tunnel said to be 800 feet long has been driven. Rock purporting to come from this mine showed a little cinnabar in altered

and iron stained serpentine, but no ore in any amount was reported. There was no reduction equipment. The country rocks are highly altered and silicified sedimentaries.

New Idria Quicksilver Mining Co., W. B. Buckminster, vice president and general manager; home office, 141 Milk St., Boston, Mass.; H. W. Gould, general superintendent, Crocker Bldg., San Francisco; James G. Finch, superintendent; mine office, Idria, Cal. The mining property includes the Idria, West Idria group (3 claims), Sulphur Spring, Molino, San Carlos group (6 claims), covering 240 acres in addition to other patented land. The claims are located in Secs. 28, 29, 32, 33, 34, 35, T. 17 S., R. 12 E., and Secs. 3 and 4, T. 18 S., R. 12 E. The elevation at the office is 2500 feet (U. S. G. S.) and 4000 feet at Idria Peak, the summit of the mine hill (see Photo No. 21). More than 95% of San Benito County's recorded production of 296,899 flasks of quicksilver from 1858 to 1915 (inc.) came from the New Idria property. The mine has been in continuous operation since 1850. The present company has been in possession since April, 1895.

There are two main ore areas (so to speak), the New Idria group and the San Carlos group, the latter of which lies over 2 miles to the southeastward of the former. The principal output to date has come from the New Idria, though at the present writing (March, 1916), ore is also being drawn from the San Carlos mine through the "Molino Tunnel" and trammed around the hill to the Idria furnaces. The portal of the Molino tunnel is about midway between the two main groups. This adit was driven southeasterly about 4000 feet in length and cut the ore body some distance below the old San Carlos workings. A raise was driven, and connections were completed early in 1915. At several places in the Molino adit near cinnabar-bearing veins, pyrite in small crystals was encountered, stated to assay \$1.40 per ton in gold. The ore occurs in the Franciscan metamorphic shale and sandstone, near the contact of the large serpentine area.

An idea of the size and shape of the main New Idria ore-body, or rather "ore-zone," may be gained from the outline shown on Plate III, which was traced from the mine map by courtesy of the superintendent, Mr. Finch. On account of the very large number of adits, crosscuts, drifts, levels and intermediate levels, no attempt was made to reproduce them, which would only have complicated the drawing. For similar reasons, the outline of the ore zone was taken at three separated levels, only: the 2d, 5th and 10th. This shows a roughly elliptical shape in the upper levels, narrowing, lengthening eastward, and curving toward a crescent shape in the lower levels. The No. 7 level (not shown) has a distinctly crescent outline. This zone has a general dip to the southeast



Photo No. 21. Panoramic view of New Idria Mine, plant and town, San Benito County, looking southerly.

of about 60° to 65° . It varies up to 235 feet wide between walls and 800 feet long on the No. 5 level, and averages about 120 feet wide, with a length of nearly 1200 feet on the No. 10 level.

The term "ore zone" is deemed by the writer a better designation in this case than "ore-body," because all of the rock within the outlines noted is not ore. The ore occurrences are not altogether regular. There are various veins, cross-veins, stock-works and impregnations.



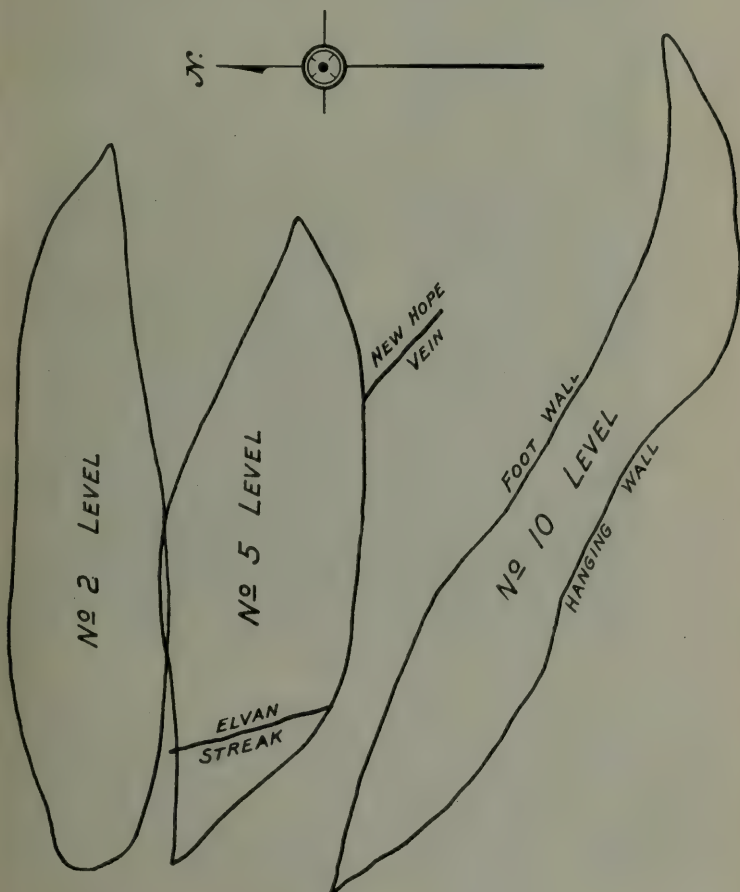
Photo No. 22. Flashlight view in square set stope (30' wide) between No. 2 and No. 2½ levels, New Idria Mine.

The main ore-body within the area is stock-works in slate and shale, and in places an impregnated sandstone, somewhat harder than the others. As will be noted from the map (Plate II), the mine is in the Franciscan metamorphic sandstones and shales and some distance from the contact of the large serpentine area already mentioned. The hanging wall is marked by a black clay "alta," outside of which is slate, then sandstone

OUTLINE OF ORE BODY
NEW IDRIA QUICKSILVER MINE
SAN BENITO CO. CAL.

Scale :- 1 inch = 200 feet.

(Traced from the mine map, Sep't 1914.)



and finally serpentine beyond. The footwall is not as distinctly defined as the hanging, the value frequently not showing a sharp stopping off line.

The mine workings are complicated and numerous, due to the irregularity of the ore shoots. Considerable timbering is required, especially in the larger stopes, where the square set system is employed (see Photo No. 22). The stope shown is 5 sets (6 feet each) wide, or 30 feet. Others are up to 50 feet square. The two more important ore shoots developed are at opposite ends of the zone. The "Bodie shoot" is at the east end, the other being known as the West End shoot and has been an important producer, especially below the No. 5 level. There are two other veins, known as the Elvan Streak and the New Hope, which are quite distinct from the main ore-body. The former cuts across the main zone, while the latter cuts across the hanging wall to the ore-body but stops at the "alta." At the time of Becker's visit (1884)⁹ development had not yet proceeded to the point that these relations were as evident as they now are. The Elvan streak is described as a "clean-cut fissure, filled with decomposed attrition products which are impregnated with cinnabar." This gouge material is misnamed "tale" by the miners. At one point associated with this vein was a considerable amount of metacinnabarite, which it is stated, amounted to several tons. The New Hope vein was distinctly of metacinnabarite, in the upper levels, where it was very rich; but it has not been worked in the lower levels. In the main zone pyrite, though not abundant, is associated with the cinnabar, and the gangue minerals are quartz, calcite and gypsum. From the north end of the New Idria to the south end of the San Carlos, the ore-bearing area has been proven for a length of $2\frac{1}{2}$ miles.

As already stated, the mine workings are rather complex, if one attempts to consider them in detail. Development is mainly by adits, with connections by raises and winzes. There are ten main levels, No. 1 to No. 10, and a number of intermediates. The No. 10 tunnel, which is the main haulage way for delivery of ore to the furnaces, is 3175 feet in length to the vein, at which point it is 1060 feet vertically below the outcrop. There is a total of 15 to 20 miles of underground development in the company's property, including 5000' in the San Carlos, 5000' in the Molino, 600' in the Creek tunnel and over 3 miles of open working tunnels (crosscuts) in the New Idria. The system of mining in use is that of overhand stoping, and timbering with square sets. Pneumatic stopers and drills are employed; and a certain amount of hand-sorting is done within the mine. Material from some of the former waste dumps is also being sent to the furnaces. On the No. 9 level there is a grizzly 22' long of $\frac{1}{2}$ " bar iron on edge, spaced $\frac{1}{2}$ " apart at the top and $1\frac{1}{4}$ " at

⁹U. S. G. S., Mon. XIII, p. 305.

the bottom. At that point there are two chutes, one for fine ore and the other for coarse, leading to No. 10 level, where the cars are loaded and hauled in trains by mules to the furnaces. There is a winze from No. 2 level to No. 9, in which a gasoline hoist operates a skip for tools and timber down to the No. 7. A 25-h.p. distillate engine furnishes the power.



Photo No. 23. No. 4 furnace (small) at New Idria Quicksilver Mine.
A 1-tile, fine-ore furnace for treating soot.

Power for driving the compressors, dynamo for lights and furnace blowers, is obtained from San Carlos Creek for about six months of the year. The reservoir is above a series of falls, near the Aurora mine, and gives a head of 975 feet. A General Electric generator 4-45-975, driven by a 27-inch Pelton wheel furnishes current for lights and blowers. The main compressor is driven by a 30-inch Pelton-Doble water-wheel. When the water is short this compressor is driven by a 60-h.p. distillate engine, and there is a 40-h.p. distillate engine for a

smaller, auxiliary compressor. At the 1914 prices distillate cost 12c.-13c. per gallon at the mine. At the portal of No. 2 level there is a steam-driven sawmill of 2000 b.m. ft. daily capacity; also, a timber framer run by a 9-h.p. distillate engine. The latter consumes 53 gallons of distillate per month. There is also a saw especially set for cutting wedges. Round timbers are used—both pine and cedar. Some timber is cut on land owned by the company, and some also cut eleven miles

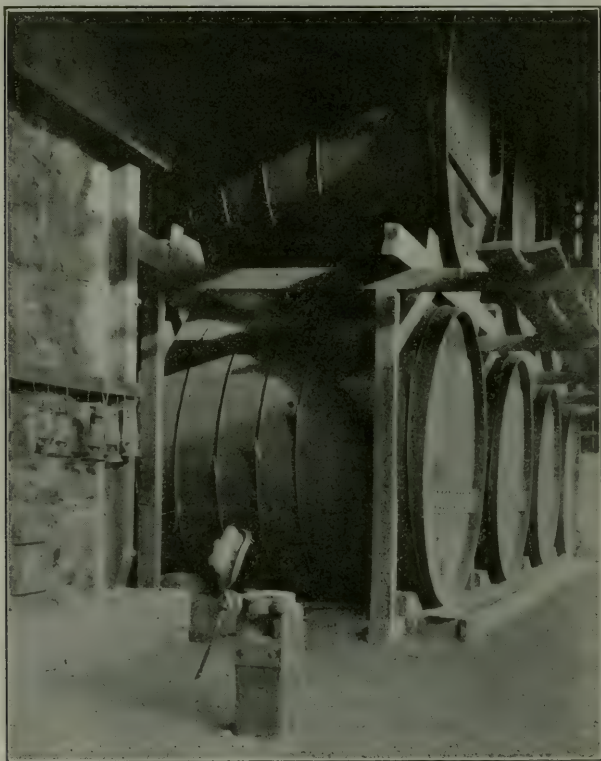


Photo No. 24. Barrel condensers, New Idria Mine.

to the south of Idria, within the Monterey National Forest, under contract with the United States Forest Service. The blacksmith shop at this level is equipped with a Waugh drill sharpener. The No. 2 adit is the main entry to the mine for timbers and other supplies, from which they are distributed to the levels below by means of the winze and hoist previously mentioned.

The reduction equipment of the New Idria company includes two

Idria coarse-ore furnaces of 88 tons daily capacity each, a 60-ton Scott fine-ore furnace and a smaller Scott furnace of 9 tons capacity. In the panoramic view (Photo No. 21), the coarse-ore furnaces are in the large building in the center against the hill, the fine-ore furnace being to the left, from the stack of which the streak of white smoke is seen. The New Idria coarse-ore furnace is of a design developed by Mr. B. M. Newcomb, for many years general superintendent of the property, and is described by Forstner,¹⁰ with drawings accompanying. The fine-ore furnaces are of the Scott pattern. The smaller one is worthy of special mention here. It was made the subject of a brief footnote in a recent report by the writer.¹¹ This furnace (see Photo No. 23), is one tile (3') long and 25 tiles high (28' 1½"), with a 3" spacing between the tiles instead of 6", as in the larger Scott furnaces. Also, the tiles are set on a 50° slope instead of a 45°. The furnace has a capacity of 9 tons and was built to treat furnace soot instead of retorting it, as is done at most quicksilver mines. The soot is first washed with water in a series of boxes, with compartments, which discharge to each succeeding one alternately at top and bottom. This frees much of the enclosed quicksilver. The soot is then dried on a large iron pan, with inclined bottom, and steam-heated. With each one ton of dried soot are mixed 8 tons of fine ore, and the mixture fed to No. 4 furnace. The condensers near the furnaces are of stone, the others being of wood in barrel form (see Photo No. 24). The flues and stacks are also of wood-stave construction (see Photo No. 25). The furnaces are fired by crude oil; but in starting up a cold furnace, wood is first used before turning on the oil, until the fuel box is heated enough to keep the oil vapor afire. This lessens the danger of back-firing, or the flame going out temporarily and filling the furnace with gas, which would explode on the oil being relighted. On the basis of approximately 75c. per barrel at Mendota, crude oil for fuel costs \$2.75 to \$3.00 per barrel at the mine.

Since the writer's visit to New Idria, we are informed that in December, 1915, two New Standard concentrating tables had been installed between the grizzlies and the No. 1 (fine-ore) furnace. The fine ore, after passing through the grizzly, is fed onto a shaking screen of 8-mesh, the coarser material going direct to the Scott furnace and the through product to the concentrators. In two 8-hour shifts, these two machines were (December, 1915), handling a total of 36 tons of ore, and making 4½ tons of a concentrate carrying approximately 6%-7% mercury, from an original ore of about 0.5% mercury. By thus eliminating the very fine material from the ore, which has a tendency to interfere with the furnace draught and to hold back the volatilization of the quicksilver, the capacity of the Scott furnace has been raised to about 75 tons daily.

¹⁰Bull. 27, p. 213.

¹¹"Mines and Mineral Resources of Colusa, Glenn, etc.," p. 56.

On account of the large percentage of fines coming from the mine, some of this ore was being added to the coarse-ore furnace charge. Naturally this interfered in a more marked degree with the capacities of the two coarse-ore furnaces than the extreme fines did with the Scott. The elimination of practically 32 tons daily of the extreme fines by concentration has thus relieved the No. 2 and No. 3 furnaces of fine ore, giving them, also, freer action and increased capacity. The concentrates after drying are charged with ore to the Scott furnace.

The following summary of operations during the year 1914, compared with the figures for 1913 and 1912, is taken from a published¹² extract from the annual report of the New Idria company for that year:

	1914	1913	1912
Development, feet	12,367	9,182	11,080
Ore treated, tons	62,578	76,993	76,348
Quicksilver recovered, flasks	6,550	9,700	9,600
Average price per flask	\$41		
Total revenue	\$295,361	\$363,054	\$377,484
Operating expenses	340,371	298,041	303,721
Loss	45,010	*65,013	*73,763
Dividends	10,000	40,000	120,000
Previous surplus	114,600	119,587	165,824
Surplus carried forward	89,590	144,600	119,587

*Profit.

"Storms involved the expenditure of about \$20,000 in repairing the property and roads, and extraordinary development and lower grade ore all contributed to the decreased earnings. The known ore-bodies have been nearly depleted above No. 7 level. Development was principally done on No. 9 and No. 10 levels, which produce most of the ore. The Molino adit, to develop the San Carlos deposits" was completed and the raise started to connect them.

In 1914, up to July, 400 men were employed, when the number was curtailed and one of the coarse-ore furnaces shut down: so that in September when the writer visited the property, there were 171 in the mine and 53 on top and around the furnaces—a total of 224 men on the payroll. Since then, however, due to the rise in the price of quicksilver, more are being employed, and all of the furnaces are operating.

Bibl.: Rep. I, p. 26; IV, pp. 336, 339; VIII, pp. 483-485; X, p. 515; XI, p. 373; XII, p. 365; XIII, p. 599; Bull. 27, pp. 9, 22, 125-129, 138-145, 213, 214, 234, 241, 245; Bull. 67, pp. 33, 35; M. & M. Res. Colusa, Glenn, etc., p. 56. U. S. G. S., Mon. XIII, pp. 64, 189, 215, 291-308, 465; Min. Res. 1882 to 1914. MIN. RES. W. OF ROCKY MTS. (Raymond), 1868, p. 264; 1869, p. 10; 1870, p. 759; 1871, pp. 58, 528; 1872, p. 523; 1873, p. 497; 1874, pp. 28, 37; 1875, p. 13. GEOL. SURV. OF CAL. (Whitney), Geol. Vol. I, pp. 57-60; Vol. II, pp. 113-120. TRANS. A. I. M. E., Vol. XXXIII p. 484.

¹²Min. and Sci. Press, Vol. 110, p. 601, Apr. 10, 1915.

Niesen Group, Jno. Niesen, Hernandez, owner. Two claims, the Tiger and Buck, in Sec. 31, T. 18 S., R. 12 E., and Sec. 36, T. 18 S., R. 11 E., make up the property, which lies on the headwaters of the San Benito River, 5 miles from Hernandez and about 30 miles from Coalinga. The country rocks are the sedimentary formations, sandstones and shales, lying south of the serpentine area and are probably of Cretaceous age. They have been somewhat indurated by folding. The tunnel on



Photo No. 25. Blower and stack from fine-ore furnace, New Idria Quicksilver Mine.

the Tiger claim, which is the only development so far done, was driven 100 feet northeast and 75 feet east and is entirely in an indurated black clay shale, which shows abundant efflorescences of epsomite and some ferrous sulphate. A 2" streak of gouge at the end of the drift carried a minute trace of cinnabar, and the writer noted one or two specks of cinnabar in rock brought out from the breast of the tunnel. There was

no other evidence of mineralization; no contact had been cut and surface indications were not such as to encourage exploration.

Stayton Mines lie in the extreme northeast corner of the county and partly in Merced County. They were worked considerably between 1870 and 1880 and are credited with some production from ore treated in a retort. The cinnabar disappeared at depth and the district lay idle until interest in antimony induced renewed prospecting and several claims were located on stibnite prospects here. (See Antimony.)

Gypsy Mine, last operated by the same company holding the Stayton claims, had a recorded production of about 1000 flasks, from ore handled in retorts. There has been no activity in quicksilver mining in the Stayton district for many years, although at one time the Gypsy was regarded as an extremely promising property. The geology and development are well covered in the references cited below, and there has been no work on the property since the last report.

Bibl.: Bull. 27, p. 147; Rep. VIII, p. 485; Rep. X, p. 515.

Tirado Group, Jose Tirado, Hernandez, owner. There are two claims, the Capitola and San Domingo, in Sec. 18, T. 18 S., R. 12 E., $2\frac{1}{2}$ miles by trail northeast of the Alpine furnace. The locations were made late in 1914, as the result of discovery of some very rich float ore by Silvester Tirado. The claims follow the strike of the mineralized zone mentioned in describing other mines of the district. The Andy Johnson corners the San Domingo on the southwest and the Monterey claims nearly surround the Tirado claims, which cover ground overlooked for years by miners who have appropriated nearly all the mineral ground in the district. At only one spot has a cropping of rock apparently in place, and carrying cinnabar, been found. This is on a steep hillside near the southeast end of the San Domingo. The loose serpentine has been deeply eroded by a tributary of Clear Creek and it is in this stream that ore has been found.

The locator and two employees were busy at the time of my visit, cracking boulders, in which rich pockets of cinnabar were often found. These boulders undoubtedly came from some immense outcrop of the cinnabar bearing zone which had once stood above the surface of the serpentine, as do the tips of Los Picachos today, but which have been so eroded and mantled by the loose sliding serpentine as to be hidden now except for the one spot mentioned. The rock here is in part a siliceous breccia which appears to have been cemented by silica deposited from solution which apparently also bore cinnabar, or was followed by deposition of cinnabar in the cavities of the rock mass. The cinnabar is found at times in cavities as drusy coatings or in nearly solid masses 6" or 8" thick. Elsewhere the boulders resemble the croppings at Los Picachos. It would seem as if a rather rich ore shoot had been broken

up here by the creek branch, which has carved a deep cañon across the strike of the outcrop zone, and concentrated the high-grade ore in its stream bed.

Several tons of this ore were ready for burning in the 6-pipe retort which had just been completed, and work was going on to expose, if possible, some good showing of ore in place.

Wonder Mine, Manuel Gonzales, Idria, owner. This mine is about 2 miles west of Idria, at an elevation of 4000 feet (barometric reading), and was opened up in 1910. The cinnabar occurs in a soft, partly serpentinized sandstone, in part as an impregnation and also as seams 1" to 1½" in width. Some pyrite accompanies the ore. The strike of the vein is east of south. There are two adits, both being drifts, and on nearly the same level, one being in 250 feet, reaching a depth of about 100 feet below the outcrop. There are also 2 or 3 short crosscuts and some small overhand stopes. Wheelbarrows are used to carry the ore to the retort, which is of six 10-inch pipes set in rather crude walls of mud-plastered rubble masonry. Each pipe treats 100 lbs. of ore daily. Slightly over a half-cord of wood is burned per day. The wood is scrub oak and manzanita, cut close to the mine, and costs \$1.50 to \$2.00 per cord. There were four men at work, two being underground, one at the retort and one cutting wood.

STONE INDUSTRY.

Crushed rock and gravel are at present the only materials of this class handled in the county. Gravel is used only locally, but the rock-crushing plant operated at Logan supplies a wide market, both north and south.

Berberich Gravel Pit, owned by C. F. Berberich, of Hollister, comprises an area of six acres at the northern edge of the town. Wells have been drilled into this deposit, which showed a depth of 110 feet in gravel and indicate a practically inexhaustible supply. The material consists of clean gravel and sand, with very few cobbles over 3" size, and with a soil overburden of only 1' or 2'. The material sells for 50c. per yard at the pit. It has been used in paving the streets of Hollister and in a good many buildings in the town. Mr. Berberich has owned the deposit about six years and has displaced his competitors, whose pits are not so well located.

The County of San Benito operates a small pit a short distance south of Hollister, where material for road work is obtained. The gravel is not as clean nor as uniform in size as at the Berberich pit. A small crusher operated by a gasoline engine is used to crush the coarser cobbles.

Granite Rock Co., W. R. Porter, San Francisco, president; A. R. Wilson, Watsonville, vice president and manager. The plant is located at Logan on the Southern Pacific Railroad, near the Santa Cruz county line. The location of the plant and quarry is very favorable for cheap working and transportation. The granite forms the wall of the Pajaro River Cañon at this place and rises about 400 feet from the railroad tracks. The company owns 550 acres in all, about 100 acres of which can be worked.

A face of granite has been opened approximately half a mile long, but work at the time of the writer's visit was being carried on along a face of about 500 feet. The bench on which the steam shovels work is 150 feet vertically above the main line tracks. From this working level, the face rises 230 feet. An overburden of Monterey sand, shale and conglomerate increasing from 3 feet to 50 feet at the southeast, lies on the weathered granite. To dispose of this, a hydraulic plant is operated. Water is pumped under 200 lbs. pressure in a 5-inch pipe line from the Pajaro River to the summit of the hill, one-third of a mile. From here the sediment is hydraulicked off, running southeast down the dip of the granite dome to an impounding dam at the foot of the slope. At times lenses of tightly cemented conglomerate are found which have to be blasted. With the detritus removed, the face is attacked near the base with a heavy Ingersoll drill. A round of 3 or 4 holes, 22' deep and 16' to 18' apart, is put in. One such round driven last summer was loaded with 17 boxes of dynamite. The mass of rock broken (and caved from the top as the result of shooting out the bottom) kept a steam shovel busy two months.

The crushing and classifying plant consists of two units. The smaller of these, which is the old plant, has a maximum daily capacity of 1200 tons. The new plant handles 2000 tons a day.

Marion steam shovels load the broken rock (which in the case of large blocks is blasted a second time) on cars hauled by dinkey engines. The course of the rock is essentially as described below for the new plant; in the old plant, gyratory crushers instead of rolls do the last stage of crushing. From the cars the rock up to 18-inch size passes over a 32-foot grizzly. The fines through this grizzly consist largely of dirt and rotten, weathered rock, but a trommel recovers some good rock. The waste passes to a bin of two carloads capacity. From here it can be sent by two "kickers" over a belt conveyor to an elevator, which lifts it to the quarry level, where it is hauled off to a dump, or it can be run down to a bunker above the railroad tracks. The company gives this rock away to any one paying the freight.

The merchantable rock goes over the grizzly to a No. 8 gyratory crusher; from this, 2" rock and smaller is classified in a 22' trommel and goes to elevators, thence over belt conveyors to the various bins, and

the coarse rock, 3" to 4" in size, passes to a No. 5 gyratory crusher. The oversize from this crusher is fed to a set of 54" x 24" Superior Rolls which crush to 2" size. All the undersize from the No. 5 crusher and the product of the rolls is elevated to two large trommels which classify the different sizes ranging from dust to 2". The graded product is fed directly to 4 of the bins and over belt conveyors to the other 8. The bunkers dump directly into the railroad cars below. Two motor car drags are used to handle loaded cars and fast time can be made in loading.

A crew of 48 men is employed. Seven work on the loading crew, five at the large, and four at the small crusher plant, with six on the steam shovels. Only one machine drill is required. The two steam shovels burn about 500 gallons of crude oil daily. The crusher plants are operated entirely by electricity, and 800 h.p. per day are consumed. In the large plant eleven motors are used. The No. 8 crusher uses 150 h.p.; the rolls are operated by a 100-h.p. motor, and another of same size runs the No. 5 crusher, an elevator, and a trommel. The tailings elevator requires 50 h.p. Equipment at the smaller plant includes one No. 7½ gyratory crusher, two No. 3 McCully, one No. 5, and one No. 3 Gates crushers, and 15' x 4' trommels, with necessary conveying and elevating equipment. There are 6 storage bins at this unit.

Besides two No. 50 Marion steam shovels, quarry equipment includes 3 "dinkey" locomotives and 40 cars. During the year the quarry is in actual operation about 10 months. Production annually exceeds 300,000 tons.

The rock is a well-weathered basic granite. Bunches of highly acid and highly basic constituents are present, apparently the result of magmatic separation. The crest of the dome appears to have been passed, but there is an immense reserve of rock to the northeast, and under the present workings the granite can be broken down to near the track level, 140 feet below. The rock is in demand for highway construction and is also used a great deal for ballasting railway road beds. The fact that the plant is the only one of any size for a long distance north or south and is in a position to deliver rock on the cars at a very low cost, makes the market for its product a wide one.

SAN LUIS OBISPO COUNTY.

BY C. A. LOGAN, Field Assistant.
Field Work in November, 1915.

HISTORY and TOPOGRAPHY.

In September, 1772, the Mission of San Luis Obispo de Tolosa was established by the Catholic Fathers on the site of the county seat, and the village which grew up about it took the same name, which was also bestowed on the county when it was established as one of the original twenty-seven, shortly after the state joined the Union. While known principally as a cattle-raising and farming district, the county has also yielded a fair tribute to the miner's enterprise.

Bounded by Monterey County on the north, Kern on the east, Santa Barbara on the south and the Pacific Ocean on the west, the county comprises alternate mountain chains and narrow valleys which strike northwest and blend together at the southeast, as would the sections of an open fan. In the southwestern part of the county lies the valley of the Santa Maria River and the smaller troughs which flank the San Luis Range. These mountains meet the Pacific at Point Buchon and form the southern coast line. The higher peaks of the chain are in the northwest and are hardly 1900 feet in elevation. North and east lie the fertile valleys of Los Osos and San Luis, which are separated by a scarcely perceptible divide. Los Osos Valley in its northwestern part lies submerged in Morro Bay and the free sweep given to moist winds and fogs over these valleys helps farming greatly by lessening the need for irrigation.

Extending through these valleys from San Luis Obispo to Morro Bay is an independent line of volcanic cones, the most northwesterly of which, called Morro Rock, stands 600 feet out of the ocean at the entrance to Morro Bay. To the northeast lies the Sierra Santa Lucia, the principal range of mountains in the county and the divide between those waters which enter the Pacific directly on the one side, and the Salinas River on the other. Beyond the Santa Lucia lie the San Jose Valley and the Salinas River Basin, which are bounded by the San Jose Range. East and southeast of this minor chain are the valley of the San Juan River and the peculiar fault valley known as Carrizo Plain, which has an elevation of about 1500 feet and has no outlet, all its scanty run-off gathering near the center in Soda Lake. Finally, forming roughly the county's eastern boundary, are a few peaks of the Temblor Range, including McKittrick Summit, which is 4323 feet high, and Midway Peak, with an elevation of 3651 feet.

SAN LUIS OBISPO COUNTY—Table of Mineral Production.

Year	Bituminous rock		Brick		Chrome iron		Gold, value	Mineral water		Petroleum		Quicksilver		Stone industry, value	Miscellaneous and unapportioned	
	Tons	Value	M	Value	Tons*	Value		Gallons	Value	Barrels	Value	Flasks	Value		Number and kind	Value
1876 ^b												6,125	\$282,832		*100 tons copper	\$7,287
1877												3,316	121,463			
1878												2,151	74,768			
1879												579	2,368			
1880					215,300	\$189,704										
1881					1,800	24,000										
1882							\$5,000									
1883					4,969	90,809										
1884																
1885					600	8,800										
1886					576	13,140	0,164									
1887	30,000	\$150,000			600	7,980	1,740									
1888	43,000	\$215,000			300	2,550	3,000									
1889					4,400	66,600	6,510									
1890					687	3,490	8,500									
1891					74	602	1,280									
1892							1,472									
1893							600									
1894	0,132	\$2,333			4900	10,500	1,200							\$8,772	3200 tons asphaltum (rock).....	4,000
1895	6,334	17,600	750	\$3,750	4700	6,600	3,000					20	800	45,050	500 cu. ft. Cal. onyx (arag.).....	20,000
1896	5,112	11,464			2000	2,600	3,000					101	3,000	17,407	400 cu. ft. Cal. onyx (arag.).....	4,000
1897	2,321	5,117					2,500	7,800	\$1,00			101	3,000	13,500	238 cu. ft. Cal. onyx (arag.).....	1,000
1898	4,788	18,927	830	3,250			1,800	800	100			354	11,000	45,000		
1899	10,818	40,358	650	3,250								391	17,700	6,710		
1900	3,346	12,300	500	4,000								515	23,886	44,825	16 tons asphaltum (rock).....	320
1901	9,472	\$35,070	650	6,200			300	24,000	6,000			840	41,514		2000 tons asphaltum (rock).....	30,000
1902	1,700	2,327	950	7,650			2,359	4,500	800			3,312	147,215		1000 tons asphaltum (rock).....	10,000
1903	3,362	7,572	700	6,000			1,840					4,577	182,500	58,374	100 barrels lime	100
1904							600	1,000	1,000			4,745	176,016	31,000		
1905	2,333	6,345	600	3,200			290					5,733	193,745	60,000		
1906	2,533	6,644	300	2,400								5,511	178,152	55,500		
1907	2,167	6,128	2,000	10,000			316	4,800	1,000	48,127	\$16,815	2,569	98,743	5,000	6,000 tons asphaltum (rock).....	90,000
1908	5,077	21,575	1,140	12,000				4,500	1,030	10,000	5,000	867	36,648	780	300 barrels lime	600
1909	2,731	6,369	2,245	19,665				4,000	1,000	20,000	15,000	317	13,510	100	1,000 tons asphaltum (rock).....	55,000
1910	1,983	4,616	500	6,000				6,000	1,000	22,310	11,165	603	25,476	75	13,000 tons asphaltum (rock).....	100,000
1911	2,710	5,320	2,600	18,000				2,000	1,000	38,002	35,146	569	26,180			
1912	807	1,172						2,500	85	2,120	1,400	606	27,998			
1913	609	1,149	1,750	17,500			134	1,500	600			1,368	46,667	134		
1914	579	1,118						1,000	250			1,206	62,097			
1915					0			1,500	075			1,173	123,512	76,175		
Totals..	157,497	\$636,882	16,055	\$321,935	30,809	\$432,537	\$51,655	12,200	\$17,060	114,058	\$74,015	44,242	\$1,513,411	\$368,032		\$417,707

*Copper was weighed in tons of 2,560 pounds and chrome iron in tons of 2,240 pounds. Elsewhere the ton is 2,000 pounds.

^bThe total production of asphaltum up to 1894 was reported as 800 barrels. This production reduced to tons is shown under 1894.

^cAlthough a great deal of chrome iron ore was mined and marketed during the '70s, there are no records of yearly production. The above figure for 1880 represents the total shipments from San Luis Obispo up to August, 1880.

^dThere are no records of annual mineral production for the period of 1867-1876, but there was a small annual gold production from shallow placers before this, and these placers have no doubt yielded considerable gold never reported. The same observation applies to a number of small quicksilver properties worked in the '60s.

^eConcentrates. ^fIncluded with other minerals.

TRANSPORTATION.

The Southern Pacific Railway traverses the county from north to south, crossing the Sierra Santa Lucia through Cuesta Pass, and going nearly south through San Luis Obispo, and thence to the coast near Pismo, giving rail connection with San Francisco and Los Angeles.

From San Luis Obispo the Pacific Coast Railroad (narrowgauge) has a line to Port San Luis on deep water, and another which serves the district lying between the county seat and Santa Maria.

The rest of the county not adjacent to the railroads relies on auto stages for mail and passenger service. Two such lines operate daily over easy grades from San Luis Obispo to Morro, Cayucos, Cambria and San Simeon. Pozo and the La Panza country are reached through Santa Margarita by triweekly trips. The eastern plains region communicates with the railroad at McKittrick. Freight service is given to the upper coast towns by the steamers of the Pacific Coast Steamship Company.

GEOLOGY.

The geology of that portion of the county from the southern boundary to latitude $35^{\circ} 30'$ N. and from the coast to longitude $120^{\circ} 30'$ W. has been covered in Folio 101 of the United States Geological Survey. For the geology of the oil districts in the county, the reader should consult Bulletin No. 69, recently issued by the California State Mining Bureau. Space does not permit of any lengthy discussion of the subject here, but in the description of the various mineral deposits some brief geological notes will be found. Features of greatest interest are the thermal sulphur springs and wells, the bituminous sandstones and the deposits of chromite and quicksilver.

MINERAL RESOURCES.

Gold production began before 1850 and copper was mined in small quantity in the early '60s. Antimony and manganese occur, but have so far yielded no ore in commercial quantities. Chromic iron or chromite has been mined along the entire length of the Sierra Santa Lucia, and quicksilver's chief ore, cinnabar, is reported over an equally wide range, though developed chiefly in the northwest. In the south and southwest, bituminous rock and asphaltum have been worked a good deal, and some heavy oils developed. Here, also, as well as around Paso Robles, are many thermal sulphur springs and wells. Granophyres, sandstone, volcanic ash and California onyx have been used for building purposes, but granite, although plentiful, is so far unutilized. Bricks have been made in considerable quantity. There are also found in the county deposits of diatomaceous earth, pumice, gypsum, limestone and some asbestos of uncertain quality, on which little or no

development work has been done. A small annual output of mineral water has been reported for several years.

No segregated figures for annual mineral production previous to 1880 are obtainable, and therefore the figures given in the table must not be taken as representing the total value of the mineral yield. All available records have been examined and only dependable figures are quoted.

ANTIMONY.

Marquat Estate, owner. Mrs. Bena Marquat, administratrix, San Luis Obispo, California. This prospect is described in the Tenth Annual Report of the State Mineralogist, page 579. It is located in the SW. $\frac{1}{4}$ of SW. $\frac{1}{4}$ of Sec. 2, T. 27 S., R. 9 E., 15 miles from San Simeon by road. While the writer of the above-mentioned report speaks of a ledge 8' wide, the present owners of the land know nothing of such a large body. At the place where the prospecting has recently been done, there is a fissure zone about 3' wide in tightly cemented Franciscan sandstone. The vein material is quartzitic with occasional seams of soft selvage, and the ore, which is stibnite, makes in a width of about 1' next to the footwall, the rest of the vein at outcrop being barren as far as uncovered. A tunnel about 40' long has been driven, but not so as to expose the vein. A shaft sunk on the vein to a depth of 18' was full of water when visited. It is reported, however, that a foot of good ore was exposed when work stopped. Strike of vein NE., dip N. 70° W. An analysis of low-grade ore taken at random from the surface croppings shows 18.3% antimony. One shipment of ore was made many years ago to San Francisco.

ASPHALT.

Natural asphalt was formerly used a good deal in this state for paving and San Luis Obispo County was a considerable producer of it. Of late years, however, the natural product has been displaced by the material yielded in crude oil distillation, as the latter is more uniform in quality and more cheaply obtained.

As formerly worked, the asphalt was scooped up from the ground at the places where earth faults or folding had broken the strata and permitted seepage. Usually the material was mixed with dirt and had to be refined by melting the mass into vats and drawing off the hot liquid asphalt. The principal deposits were on Tar Spring Creek, 9 miles east of Arroyo Grande, and in the bituminous rock area near Edna. There has been no output of natural asphalt from either locality for many years.

Bibl.: State Mining Bureau Reports VII, p. 97; XII, p. 30;
U. S. G. S. XXII Annual Report, Part I, p. 412; Mineral Resources 1883-4.

The California Liquid Asphalt Company, with offices at Santa Barbara, have a refinery at Hadley where "Atlas Brand" asphalt (as well as distillate, gasoline and kerosene) is produced. The capacity of the plant, which was erected in 1909, is 13,000 barrels of crude oil and it can turn out 1000 tons of asphalt per month. It is now idle (Dec., 1915), and has been so for several months. The product has a wide market, being sold extensively outside of the United States, especially in Canada and Germany, but the war has greatly curtailed sales, causing the cancellation of important contracts. The crude oil has formerly been obtained from the Santa Maria field but it is probable that when operations are resumed the product of the wells now operated by the Spokane-Parkfield Oil Company, about two and a half miles south of the refinery, will be utilized.

The oil is heated 16 to 18 hours to produce light road material and 24 hours to give heavy asphalt. The temperature ranges from 250° to 450° F.

The Ensign-Baker Refining Co. of Los Angeles also have a refinery at Hadley adjacent to that described above. The capacity of this plant is also 1000 tons of asphalt per month, with distillate produced as well. The plant was established in 1910 and was not in operation at the time the writer visited it. The oil used was brought in from the Santa Maria field. As the subject of oil refining comes more appropriately under the head of manufacturing than mining, the reader is referred to the literature noted below for such further details as may be desired, concerning processes and products.

Bibl.: California State Mining Bureau Bulletin No. 69. Western Engineering, Vol. 2, p. 223, and Vol. 3, p. 47 (1913). California Derrick, Vol. 6, January and February, 1914.

BITUMINOUS SANDSTONE.

Sands of the Pismo and Santa Margarita formations which have been saturated with and cemented together by natural asphalt, are of widespread occurrence in San Luis Obispo County. The asphalt comes from the underlying Monterey shales and when it seeps up into the overlying sand it changes the latter into a tough weather-resisting stratum.

The deposits have been most extensively developed near Edna, a station on the Southern Pacific about 6 miles south of San Luis Obispo. Other quarries have been opened along and near San Luis Bay; near the town of Arroyo Grande, and on Tar Spring Creek, 9 miles east of Arroyo Grande, where natural asphalt was also refined years ago.

For many years previous to the introduction of oil asphalt for paving, a large tonnage of bituminous sandstones was annually utilized for street work. At the present time, however, the refined product has almost completely displaced the natural sandstone and all the quarries which were worked in San Luis Obispo County, with one exception, have been idle for several years. There are ample reasons for this. Asphalt is cheaply obtained, is much more uniform in quality, and is in such concentrated form that it can be shipped considerable distances at a much less cost than the bulky bituminous rock. This last consideration of transportation costs has narrowed the possible market for bituminous sands to such a degree that it can only compete successfully with asphalt within a few miles of the quarries. Recently, too, a considerable setback has been given the industry by the tendency of the larger cities not to recognize bituminous rock in paving specifications.

Below are given a few analyses of bituminous sandstones found in San Luis Obispo County and also some others for purposes of comparison. To be most acceptable for paving, the natural asphalt, which acts as a binder in the bituminous rock, should be adhesive and not too hard; there should be from 10% to 18% of asphalt and the sand should be well distributed in screen size from dust (200 mesh) to 10 mesh or $\frac{1}{4}$ ", without an excess of either fine or coarse material. Few deposits, of course, can fill these specifications, though there have been some experiments carried on to modify the composition of the natural mixture by adding bitumen of certain quality or sand of a desired size. Among the analyses below, it will be noted that the material from the Bassett No. 7 Quarry, is a very nearly ideal natural sheet asphalt, requiring possibly a little added dust. That from the Jordan Ranch Quarry is almost a "Topeka Mix" and has been used very successfully.

Location	Per cent asphalt	Per cent screen sizes of sand—meshes per inch						
		Dust	80-200	50-80	30-50	20-30	10-20	Over 10, under $\frac{1}{2}$ -inch
(Edna) Bassett No. 7.....	13.1	6.42	21.0	25.0	23.92	6.00	1.00	3.5
(Edna) Jordan Ranch.....	11.0	5.28	3.64	9.08	18.00	11.48	12.28	29.31
Carpinteria	19.3	1.63	14.28	48.78	15.48	.41	—	—
Kasmalia	40.0	49.0	*	*	*	*	*	*
Ideal mixture	10.5	13.0	26.0	23.5	19.0	5.0	3.0	—

*Total other sand, eleven per cent.

The Consolidated Bituminous Rock Company, Nevada Bank Building, San Francisco, owns a large tract of land about one mile southwest of Edna, and has probably 40 acres containing workable

deposits of the bituminous sandstone. The formation makes prominent cliff-like walls on both sides of the narrow valley, and extends for some miles in a broad belt running nearly east and west. Several quarries have been worked in the material but now all except one are closed. This furnishes a good grade of material, without too much coarse gravel, and is very cheaply mined because of the nearness to the railroad, the small amount of overburden, and the very advantageous contract which the owners have with the local people who do the work. As it is the only such quarry operating in the county and is worked on a very small margin of profit, it would probably be unfair to publish any figures of production or costs.

The high walls permit open cut mining. Holes 9' to 20' deep are bored with augers and churn drills and a face 6' to 8' wide is broken at a round. Black powder is preferred for blasting because of its springing and heaving action on the mass, which is especially tough and hard to shatter when warmed by the sun. The large blocks resulting from the first blast are reduced either by hand or by more blasting to sizes small enough for one man to handle the rock. It is hauled to the cars in this state unless the order calls for sacked material, which has to be broken finer. Three men and six horses are employed at irregular intervals to fill such orders as are received.

The City Street Improvement Company, with office at 166 Geary St., San Francisco, owns a tract of land adjacent to the holding of the Consolidated Bituminous Rock Company, and have used a large tonnage of the material in the past for street work, but their quarries have been idle for years. There are croppings of the rock over an area of about 20 acres and the grade of material is generally good.

There are several other quarries of the bituminous sandstone which have been described in previous reports, but as none of these have been active recently, the reader should refer to the literature noted below for any details desired.

Bibl.: State Mining Bureau Reports VII; VIII, p. 533; X, p. 571; XII, p. 29; XIII, p. 37. California Journal of Technology, Aug., 1913. U. S. G. S. Folio 101.

BRICK.

Clay of good quality for brickmaking is found at many places in the county and several small plants for the manufacture of hand-made brick were formerly operated, but all of these are now out of existence.

San Luis Brick Company, A. F. Fitzgerald, president, San Luis Obispo, California, operates the only plant now in the county. It is located one mile below the Southern Pacific depot near lines of both

the Southern Pacific and Pacific Coast Railroads. The clay is light colored and just enough sand to make a good quality of common brick and has little or no overburden. Mining is done with two-horse scrapers which deliver to cars operated by a steam winch. From the cars the clay passes to a 9' "American" clay worker, from which it passes to a Bonnet elevator, where it is screened, the fines going to the home-made pugmill, thence to the "American" machine presser and cutter, and the coarse returning to the clay worker. The bricks are burnt in field kilns the size of which depend on orders in sight. Power is furnished by a steam engine with an auxiliary gasoline engine of 20 h.p. Ten acres surrounding the plant are owned by the company. When in operation the plant employs from 25 to 30 men, but no bricks have been made for two years. The plant was built in 1907 and total production is stated at 10,000,000. The brick industry of California has suffered a severe decline since the increased use of cement in building construction and the owners of this plant, in common with many others, now find little or no profit in the business.

CHROMITE.

Geology of chromite deposits.

Chromic iron ore occurs invariably associated with serpentine, or in stream placers resulting from erosion of serpentine areas, where the soft gangue is carried away and the heavy chrome particles are concentrated. In San Luis Obispo County serpentine areas are found along the entire extent of the Sierra Santa Lucia and the San Luis Range, and lenses of chrome iron have been found throughout the length of the county. The masses of ore are of all sizes, from small fragments to kidneys of many tons. These kidneys are disposed in all positions, some lying flat and some with a very steep dip, and there is no method of determining their size except by actual work. The only regularity they exhibit is a decreasing richness with depth.

The ore may occur in bodies which are lustrous black and crystalline, showing little trace of serpentine, or it may be of any grade down to the point where it occurs in small grains scattered sparingly through the serpentine. In the ore bodies that have been mined, while it may be said that the walls were "commercial," determined by the 50% standard set by buyers, it seems there must have been a pretty definite line of separation between good and poor ore, as there is nothing but very low grade, and little of that, to be found in any of the old workings.

Much has been written on the genesis of chromic iron deposits and the theory which seems to agree best with observed conditions is that the chromite is the result of magmatic separation while the peridotite (or allied intrusive rock) from which the serpentine is derived was

still fluid. It has been observed in certain deposits that the rock aggregate shows automorphic or fully developed chromite crystals under the microscope, imbedded in or imposing their outlines on the peridotite crystals which are thus shown to have crystallized later than the chromite. The purity of the chromite on the surfaces exposed to weathering is easily explained by the rapid weathering out of the serpentine gangue.

Bibl.: Harder, E. C., Bulletin 430, U. S. G. S. pp. 167-183; U. S. G. S. Folio No. 101.

History.

Although a great deal of chromite was mined in this county before 1880, it was not until that year that we find any records kept. Reference to the table of production shows that over 15,000 tons are reported to have been shipped out of San Luis Obispo up to August, 1880. But there was ore mined in districts which were more convenient to other shipping points, so there was probably a considerable production of which we have no record. The figures shown in this report credit the county with over 30,000 tons, having a value in excess of \$442,000, or about double the production usually stated.

The properties developed in the past have been those on the north side of the San Luis Range and on the south, or San Luis Obispo, side of the Sierra Santa Lucia and at a distance of $\frac{1}{2}$ mile to 15 miles from San Luis Obispo. The workings were nearly all superficial. Notable exceptions were the Pick and Shovel, Long Pine, and London mines. A great many short tunnels, 30' to 70' long, were driven, but the bulk of the ore was picked up in lumps off the surface or dug out in shallow placer workings. Many farmers when not employed at ranch work turned their time and that of their teams to good account by thus gathering and hauling chromic iron. Open-cutting was resorted to a good deal, and when a lens was exhausted this way it seems to have been the usual thing to start burrowing with short tunnels in search of more ore. The ore bodies were never continuous or extensive and seldom was any new body uncovered by sustained development; most were found accidentally, and such was the uncertainty regarding their size and the quality of ore that there was small incentive for outlay of capital.

The average price previous to 1881 was better than \$12.00 per ton. Ore being quite plentiful, a little profit was possible. Probably the heaviest production occurred during 1882 and 1883. The price averaged \$20.00 per ton and about 5000 tons were produced. Over a dozen mines were active at that time. The largest, the Pick and Shovel Mine, which is said to have contained 1200' of tunnels, produced 5000 tons of ore, over 55% chromic oxide, up to 1890. About 1890 prices fell to around \$8.00 on account of competition with high grade ores which

could be imported from Asia Minor, Greece, Austria and other foreign sources, about as cheaply as it could be sent from California. In 1890, the Pick and Shovel Mine was producing ore for \$6.50 per ton at mine portal; hauling to depot was \$2.00 more. The price paid at San Luis Obispo was \$8.00 for ore containing 50% chromic oxide. At this price it cost \$22.50 to deliver a ton at Baltimore, whereas foreign ores cost \$25.00 and less, delivered.

High grade bodies, convenient to transportation, had now been pretty well exhausted. An effort was made to save the California industry by erecting a concentrating plant in 1893 at San Luis Obispo. This operated for three years and turned out about 2000 tons of concentrates from such ore as it could get for \$8.00. Removal of the tariff proved a hard blow and production of chrome ceased in 1896 entirely.

There are no doubt many bodies of chromic iron in the county which may yet prove of commercial value. The present price of \$15.00 for 40% ore, with occasional small orders, has stimulated interest, and a great many locations and options have been taken on old mines and likely prospects. A small market exists on the Pacific coast for chrome bricks in copper furnace linings but this is supplied from deposits near the smelter, and the present market for larger quantities is still in the east, where it is required for hardening steel, lining furnaces, and in the manufacture of chemicals and in tanning. It is justifiable to look for lower freight rates when the Panama Canal is in full operation. If American ores could again establish themselves in the market while foreign ores are kept out by the European war conditions, chromite may again be mined here.¹ The tendency toward increased production of chemical salts in this country is also a helpful factor.

In the following notes only such prospects and old properties as showed signs of possible activity at the time of our visit are mentioned. There are a great many properties which have produced chromite in the past and are described in the old reports, but most of these are now of minor interest.

Castro Mine. A. A. Wheeler, 1640 Clay street, San Francisco, Cal., owner. This mine is in Sec. 29, T. 29 S., R. 12 E. It is credited with considerable past production but, unlike the owners of many other properties, the Goldtree Bros., who were formerly in possession, did not consider the business a profitable one when the price went below \$12.00, so surrendered work on this and their other claims before the deposits were exhausted.

Chorro Creek Chrome Mine. Located in Sec. 34, T. 29 S., R. 12 E., $4\frac{1}{2}$ miles north of Goldtree, a station on the Southern Pacific. It contains 86.7 acres and belongs to W. C. H. Dibblee, Otto Wannack,

¹Since the above was written a number of deposits have been opened up, and a considerable tonnage of ore is being shipped. (Nov. 1916.)

P. A. H. Arata et al., of San Luis Obispo. This is the old London mine, which produced considerable chromite in 1882 and 1883. There are a few tons of chromite of fair grade scattered over the surface of the hilltop in pieces up to the size of a brick, but no ore in place. The old works consist of superficial trenches. The property is near the summit of the Santa Lucia Range. There is also some ore in a little stream gulch down the mountain. Elevation 1800' to 1900'. No new work.

Cypress Chrome Mine. This is a prospect containing 80 acres, adjoining the Chorro Creek Mine, and but recently located by the same parties who own the latter property. Located in a very brushy section where prospecting is difficult. No development.

El Devisadero Chrome Mine. Is located in Sec. 33, T. 29 S., R. 12 E., 5 miles northwest of Goldtree and is on patented land belonging to A. A. Wheeler, 1640 Clay St., San Francisco. There is a little float chromite in sight. Idle for years.

El Salto Chrome Mine. Joins El Devisadero on the south and is also the property of Mr. Wheeler. This property yielded several hundred tons of ore in the '80's and still shows a few tons of float ore of a good grade in pieces of all size up to 1 foot in diameter. The mine is now rather difficult of access on account of thick brush and the cutting action of the small streams, which have concentrated the ore here considerably. Idle.

Mrs. Froom, of San Luis Obispo, owns some old chrome properties in the southern part of Rancho Laguna, $4\frac{1}{2}$ miles southwest of town. There are 5 old tunnels, of which one is still open for 50'. This is driven entirely in serpentine and shows some granules of chrome ore scattered through soft serpentine. There is also an old open cut with a face 40' high, which has evidently yielded a lot of good ore. Under option to Messrs. Dibblee, Wannack, and Arata, of San Luis Obispo. A little work of a desultory nature was going on and some development was promised at the time of the writer's visit.

La Primera and La Trinidad Mines, in the E. $\frac{1}{2}$ of Sec. 33, T. 29 S., R. 12 E., were worked up to 1890, by Goldtree Bros. Since then they have passed into the possession of A. A. Wheeler, of 1640 Clay street, San Francisco, and have remained idle. They are patented and each contains 20 acres. Open cuts and short tunnels were used in mining. In the latter, which are in some cases intact, the writer observed occasional small lenses of low-grade ore imbedded in the serpentine. The properties are one mile west of the Safety mine and at an elevation of 1200 feet.

Mutual Chrome Mine. This is a newly surveyed location of 80 acres, joining the Safety and Chorro Creek claims and having same

locators. It is in Sec. 35, T. 29 S., R. 12 E., $4\frac{1}{2}$ miles from Goldtree and located on a very brushy mountainside where prospecting is difficult. There was no development at time of field work for this report, and no body of chromite had yet been found on the claim.

Pick and Shovel Mine, see Safety Chrome Mine.

Pierce and Benadom Group. W. W. Pierce, G. W. Benadom and Annie Pierce, Morro, San Luis Obispo County, locators. Comprises the Chromic Acid, Chromic Acid Extension, Rocky Road, Last Hope and Sweetwater claims, in T. 29 S., R. 11 E., and lying 5 to 7 miles northeast of Morro Rock in an air line. These claims have recently been located and their owners have been quite active in development. One claim has been leased to Lloyd Newell of San Luis Obispo, California, who is at present shipping some ore, having closed a contract to furnish several carloads. The ore is mined by methods similar to those in vogue thirty years ago, but at slightly lower cost, while the expense of hauling to the railroad at San Luis Obispo, a distance of nearly twenty miles, is very high. The recent rise in price, however, and the lowered standard of ore, will permit profitable working. The lessee estimates that he has in sight 1000 tons of ore of over 45% chromic oxide and 5% silica content.

Pine Mountain. In Secs. 3 and 10 of T. 26 S., R. 8 E., there are some undeveloped deposits of chromite of good quality, as well as some old surface workings, which furnished chromite in the past.

On the beach about 2 miles south of San Simeon chromite in small chunks and boulders can be observed at low tide. The quality is said to be inferior.

Rancho Santa Rita, 8 miles northeast of Cayucos, chromite of good quality occurs in surface ore and some of it was shipped between 1880 and 1890, but no work is now going on.

T. Steele, Rancho Santa Manuela, Arroyo Grande. A deposit of a good grade of massive chromite is found on this property about 6 miles northeast of Arroyo Grande on the creek of the same name.

James Wheeler and associates of Santa Margarita have recently located a number of claims for copper and chromite along the summit of the Santa Lucia Range, extending for about 2 miles along the ridge and at a distance of from 4 to 7 miles south of Santa Margarita. Such of the ore as was seen was of a rather low grade, being mixed with a good deal of serpentine, but the region is so hard to prospect that bodies of good ore might easily be present without having been found as yet.

About $1\frac{1}{2}$ miles from the Marquat antimony mine, on government land then open to entry, massive chromite of very good quality was recently reported in boulders, the largest about one ton in weight.

On the **Souza Ranch** in the Los Osos Mountains, 5 miles southwest of San Luis Obispo, there are several old tunnels and surface trenches from which chrome was shipped years ago. Messrs. Wannack, Dibblee, and others of San Luis Obispo were closing an option on this ground at the time of the field work for this report.

Safety Chrome Mine. Locators, W. C. H. Dibblee, Otto Wannack, P. A. H. Arata et al., San Luis Obispo. This is the old Pick and Shovel Mine, which produced a great deal of chromite between 1880 and 1890 and was worked more extensively than any of the other chromite properties. The group contains 83.15 acres and is located in Secs. 34 and 35, T. 29 S., R. 12 E., about $4\frac{1}{2}$ miles north of Goldtree Station, with which it is connected by road, about $\frac{1}{3}$ of which would require rebuilding and repairing before it could be used.

Most of the old underground work is now inaccessible, but there is one tunnel 60' long entirely in serpentine which is still standing. In the roof and sides of this tunnel small patches of low-grade chromite are seen. They are one or two feet in diameter and the chromite appears as small grains up to one-fourth inch in diameter, scattered through the soft serpentine, which crumbles under the pick. The high grade ore has been well picked out and scarcely a fragment is on the dump, but the past history of the property has been good and other, undeveloped lenses may be uncovered. A little work was going on in an attempt to open one old tunnel.

COPPER.

Many copper prospects were located in this county in 1864 and a small shipment of ore was made to Swansea in 1865. The absence of a local market, the high cost of mining and transportation, and the low grade of the California ores, proved great handicaps. At that time it cost \$44.00 per ton to deliver ore at the Swansea smelter and 15% ore, which was a rather high standard for California, was worth under \$50.00, so that it required only a slight drop in price to put California ore out of the market. A lessening demand for copper, especially in India, where it had been hoarded for years before gold displaced it as a standard of value, led to lower prices and California production nearly ceased.

Copper ores in San Luis Obispo County have been invariably found in or near serpentine areas, the vein material most frequently being quartzitic and the common ores chalcopyrite or malachite with serpentine walls. Several instances occur where native copper is found as fine shot and wires disseminated through the serpentine which is extremely stained with malachite. As might be expected in a country so intensely affected by earth movements, no persistent ore body has

been developed, and prospecting has been hindered by the fact that capitalists are not inclined to take risks on showings so far made. Some very good assays have been made, one sample from the San Luisito showing 30% copper and \$5.00 per ton gold, and another from the old Silver Swan showing \$135.00 in copper, gold and silver.

Los Osos Mine, Dennis Filipponi, San Luis Obispo, owner. Situated 8 miles southwest of San Luis Obispo in the Rancho de los Osos. This mine was located in 1864. It was opened to a depth of 230' with a shaft on the vein, which was 4' to 12' wide, and there was also a tunnel 235' long, which shows ore. One hundred tons of ore carrying 18% copper were shipped to Swansea, but poor prices stopped production and the works have been caved for years.

Bibl.: Bull. 50, pp. 172-173.

Silver Swan Mine. D. & J. Hazard, Cayucos, California, owners. Located 8 miles east of Cayucos, near the headwaters of Morro and Toro creeks. There are two claims known as the Emma and Grizzly. There has been considerable prospecting here and the mine is said to have produced some copper but no data could be obtained as to the amount. Opened by a tunnel about 300' long.

Take-a-Chance Group. James Wheeler et al., Santa Margarita, California, owners. These claims, which have been recently located, lie along and near the summit of the Santa Lucia Range, 4 to 7 miles south and west of Santa Margarita at an elevation of 1500' to 2000'. Some of the claims cover formerly abandoned locations. The copper is found as native metal in fine wires in serpentine; some of the rock is coated with malachite and in places the ore is chalcopyrite. No new work has been done, but it is reported that formerly one tunnel was driven into a body of serpentine, which carried low-grade sulphides for a distance of seventy-five feet, at which depth it disappeared. Other shorter tunnels gave similar results. The native copper is found in veins or stringers about one foot wide, and has been noticed in other claims previously reported. The above group included about 30 claims at time of the field work for this report.

W. K. Hobson, Cayucos, California, has 8 claims eight miles due east of Cayucos between Morro and Toro creeks. He has found cropings of both low-grade copper and chromic iron in serpentine, but has not yet done any development work.

Wm. Drought, Cayucos, California, has a claim in the same district, on which he has found cropings of manganese and copper.

Bibl.: Bull. 50, p. 173, Sky Scraper Mine.

GOLD.

Probably gold was mined in the placers of this county before 1848 and this shallow work is still carried on, but without any system, and usually for a few months in winter and springtime of each year, when water is plentiful in the gulches. Most of the claims worked now are located on the headwaters of the little streams which drain the country lying on the east slope of the San Jose Range, and which flow into the San Juan River in the region of La Panza, although some work is done also on the western slope, along the creeks emptying into the Salinas River.

No figures of the county's gold production previous to 1882 are obtainable, but probably the estimate of \$100,000 for the unreported years is none too high, as for a time there were about 250 men mining there.

The gold is found in gravels which are from 12' to 25' deep and belong to the Monterey formation, which overlies the granite flanks of the San Jose Range. The rock as a rule is not very coarse, although boulders of good size occur in the upper gulches. There are only a few of the streams which flow perennially. The feasibility of dredging this gravel has been suggested and some property owners claim to have sufficient water supply to accommodate a small boat for ten months in the year.

Veins of quartz or other gold-bearing rocks in the granite are supposed to be the source of the placer gold, but no such veins have ever been exploited. The only serious attempt to mine gold any place in the county was made about five miles west of San Luis Obispo by the following company:

Cuesta Gold Mining and Milling Company, now defunct, on property of R. E. Jack and Mrs. Nellie Jack. Gold had been washed out of the surface dirt for a long time, and the old legend existed that this gold had helped to build the Mission. Finally, in 1908, a party named Johnson became convinced that he could successfully operate a stamp mill on the property. He obtained a lease on the mineral rights and erected a battery of three stamps. Before he had time to prove anything regarding the property's value, he sold his lease to the Cuesta Gold Mining and Milling Company. This company, carried away by values shown in the oxidized surface ore, immediately built a 10-stamp mill at an expense of about \$25,000. The mill was operated about one month and produced \$700. A tunnel was started, but as soon as the oxidized zone was passed, the values disappeared. Instead of a strong vein, only narrow stringers of quartz in diabase were found. After drifting 160' and sinking 20' the project was abandoned and in 1913 the plant was dismantled

and sold. Assays of the surface dirt are said to have run from \$2.00 to \$500.00 per ton.

Morning Star Placer Mining Co., Henry Chester, La Panza, California, manager. This company has a number of claims in Secs. 6, 7, 8, 17, 18, 19 and 20, of T. 30 S., R. 17 E.

Navajo Mines, Bert Alley, Pozo, California. Mrs. Alley claims that these properties contain a good deal of ground which will run 50¢ per yard and could be dredged with profit. They are worked at present by sluicing.

J. Smith, Santa Margarita, California, owns two claims from which a good deal of gold has been taken in recent years by sluicing.

INFUSORIAL EARTH.

Extensive beds of this material, which is composed of the siliceous casts of numberless organisms of microscopic size, are found widely distributed throughout the county in the Miocene strata locally named Pismo, Santa Margarita and Monterey formations.

One deposit covering 25 acres, according to an old report, in Sec. 23, T. 26 S., R. 10 E., was worked for a short time by a company in 1880, who attempted to market it as "Magic Polish," but were unable to make a success of it. This deposit is about 13 miles west of Paso Robles. The above company had a small mill which they used for grinding the earth.

There is another extensive deposit of the material extending along both sides of the track of the Pacific Coast Railway, for about two miles and over a mile farther northwest, beginning about one mile east of Hadley in the Rancho Corral de Piedra.

Other deposits of notable size are located both northwest and southeast of Pismo, and extend all the way to Arroyo Grande, being covered in places by the later Paso Robles sediments. There is a smaller deposit south of Morro. Nothing has ever been done commercially with any of these.

Bibl.: R. X., p. 583 and Bull. 38, p. 293; U. S. G. S. Folio 101; Bull. 315.

IRON.

A deposit of iron ore said to outcrop at intervals for over 4 miles is exposed in Prefumo Cañon, 5 miles west of San Luis Obispo, near the road and along the creek bank. Here it is about 10' thick, stands nearly vertical and strikes northwest between Franciscan sedimentary rocks. The ore is reported to vary from limonite on the east to hematite on the west, the latter proving the better grade.

Twelve years ago, 20 tons were shipped from the east end and 10 tons from the west croppings to a firm in Los Angeles, and other

lots have been shipped to the Union Iron Works in San Francisco. Mr. J. C. Welsh, of San Luis Obispo, has used small tools made from the ore, which proved satisfactory.

Analyses previously published show an average of 46.1% iron, 13.2% silica, 6% lime, 0.63% sulphur and 0.51% phosphorus. This is the limonite; the hematite is of higher quality, running about 50% iron. Not enough work has been done to give any idea of the size of the deposit.

The deposit is on a good road within 2 miles of the old Narrow Gauge spur to Bishop Peak quarry, and from here it is 8 miles to deep water transportation at Port Harford. Croppings of the ore are found on the properties of Mrs. P. B. Prefumo, The Welsh Estate, Dennis Filipponi, and others, of San Luis Obispo, California.

Bibl.: Bull. 38, p. 301; U. S. G. S. Folio 101, and Bull. 430.

LIMESTONE.

Many deposits of limestone of commercial size and good quality are found in various parts of the county. Most of these are at present too remote from transportation to be available except for restricted local use. Lime has been burned in small quantity in the Adelaide district in Secs. 18 and 19, T. 26 S., R. 10 E.; in Sec. 35, T. 32 S., R. 14 E., and on the Newson Estate, 2½ miles east of Arroyo Grande. Other unexploited deposits are mentioned in former reports, which are listed in the bibliography.

Specimens of crystallized limestone of brownish color and apparently very pure, were shown to the writer by J. W. Hobson of Santa Margarita, who says that an extensive deposit of the material crops over a width of 20' for a distance of about one mile, running northwest, 2 to 3 miles north of Santa Margarita.

Bibl.: State Mining Bureau, R. VIII, p. 532; R. X, p. 584; Bull. 38, p. 79.

MANGANESE.

Manganese is found in several localities in the western and north-western part of this county, but no ore has been shipped and little prospecting done. It occurs with lenses of radiolarian chert of Franciscan age and is secondary, being found as seam coatings and bunches in the chert. There are a great many of these chert lenses in the sedimentary formations which extend northwest from San Luis Obispo on the western side of the Sierra Santa Lucia, and in the Los Osos Range, and it is probable that many manganese deposits of small dimensions are to be found among them. Factors which

will determine their value are: cost of transportation, size of deposit, and grade of ores.

Bibl.: U. S. G. S. Folio 101; Bulletins 380, p. 271, and 427, p. 164.

Manganese ore of good grade was prospected many years ago in Secs. 6 and 7, T. 31 S., R. 12 E. This is 6 miles from San Luis Obispo and there is a fair road most of the way.

Bibl.: State Mining Bureau Bull. 38, p. 336.

W. K. Hobson of Cayucos, who has several claims for chrome and copper, has found on one of them a prominent cropping of chert, 12' to 15' wide, which carries bunches and coatings of manganese. No assays or development have been attempted. The prospect is 8 miles east of Cayucos on the west side of the Santa Lucia Range, between Morro and Toro creeks.

On the **Phelan Ranch**, R. and Jeff Phelan, Cambria, California, owners, manganese ore has been slightly prospected. It is 6 miles from the Phelan Ranch house and about 10 miles from Port San Simeon (which has deep water transportation) and there is a fair road for hauling, to within a mile of the prospect. Elevation, 1700'.

The ore occurs in a prominent stratum of vari-colored chert, 12' thick, which strikes N. 50° W. and dips into the hill at an angle of 30° to 40° NE. The chert cropping is easily traced for 200 yards or more, and along this distance at frequent intervals occur bunches of manganite of good grade. The chert around these ore pockets is colored black, presumably by iron, and a cursory view is apt to give the impression of greater masses of ore than exist, although there are several bodies of a few tons, showing fair ore throughout. Examination of the hillside above the vein showed a great deal of float ore scattered over the surface to the top of the hill, but time did not permit the field assistant to locate the source of this, which was probably another lens higher up.

Small deposits of manganese are mentioned by H. W. Fairbanks.² as occurring (1) 8 miles west of Cayucos, (2) on the north side of Clark Cañon, about 10 miles west of San Luis Obispo and (3) south-east of Prefumo Cañon. These have never been developed.

MINERAL WATER.

Only a small quantity of mineral water is bottled in this county for sale, although of course a great deal is consumed at the resorts of which no account is taken.

The **Mary Hill Mineral Well** is situated on a hill about $\frac{1}{4}$ mile west of Paso Robles. The water is pumped and is bottled in a

²Rep. XII. pp. 330, 513.

Analyses of Various Mineral Spring and Well Waters, San Luis Obispo County, California.

Parts in one million by weight.

Name	Temperature, F.	Na	K	Ca	Mg	Fe	Al	Mn	Br and I	SO ₄	Cl	CO ₃	S	AsO ₃	SiO ₂	Li	BO ₂	Organic and volatile	Gas	
																			CO ₂	H ₂ S
Buden (well)*	129°	No analysis extant. Similar to San Luis Hot Spring, but much higher in temperature.																		
Cameta (spring)	74°	Similar to Santa Ysabel Spring. No published analysis.																		
Buer Huero (springs)	59°, 62°	No published analysis.																		
Municipal Baths (well)*	108.6°	331	20	38	16	Trace	3		Trace	31	206	350			66	Trace	Trace		Trace	
Nelson's Arroyo Grande (spring)†	100.5°	62	24	60	40	33	3			116	43	216			35	Trace	Trace		Trace	
Paso Robles (main well)†	107.6°	331	20	38	16	Trace			Trace	31	206	350			66	Trace	Trace		Trace	
Paso Robles (soda bath springs)†	112°, 126°	605	11	110	1.2	.91			Trace	538	805	27			105	Trace	14	PO ₄ 1.3	196	7.1
Paso Robles (soda spring)†	77°	410	7.4	132	45	.91			Trace	310	406	142			107		Trace		137	.53
Paso Robles (iron spring)†	64°	512	Trace	45	60	12	2.3			224	241	303			15		Trace		Trace	Trace
San Luis (well) main sulphur	110°	182		20	17	46		16	1.2	96	94	171	205	3.1	27					
Santa Ysabel Springs†	94°	250	8.1	28	46	8.1	6.6	1.4	Trace	173	183	301			2°		Trace			
Grand Central (well)*		NaCl 458		CaO 24		MgO 35		Fe ₂ O ₃ Al ₂ O ₃ 15		133		91		272		Trace		Trace	CaCl ₂ NaCl	
																		205	10 H ₂ O not separately determined.	
Merry Hill (well)*		92	Na ₂ CO ₃ 21.68		K ₂ SO ₄ and Na ₂ SO ₄ 92										15					

*Denotes properties not previously reported upon, as far as known.

†U. S. G. S. Water Supply Paper 338, "Springs of California" by Gerald A. Waring

small way for local sale. In the natural state it is slightly carbonated and for medicinal use it is bottled as it comes from the well. For a beverage, it is carbonated artificially. The analysis shows a cold water carrying a noticeable content of potassium, sodium and the carbonic acid radicle in addition to the characteristic reaction for sulphur.

The Paso Robles Bottling Co. have had an agreement for many years with the Paso Robles Hot Springs Hotel Co., whereby they bottle the water of the "Soda" Spring, which is one of the group near the Mud Baths. A good deal of this water, which is artificially carbonated, is used at the hotel and there is also a small local business reported. See Paso Robles Hot Springs.

MINERAL SPRINGS and WELLS.

A surprising number of mineral springs, both hot and cold, which exhibit a wide variety of chemical salts in solution, occur in the different districts, but in the southwest and in and around Paso Robles the greatest progress has been made in making them available for public use. Transportation facilities are of course instrumental in this. Paso Robles is on the main line of the Southern Pacific, and the group of springs south of San Luis Obispo are easily reached through that city by way of the Pacific Coast Railway or automobile over the new state highway.

The hot sulphur waters are thought to be the product of chemical action in the Monterey bituminous shales, and in the case of the natural springs the outlets are determined by sharp folding and breaking of the strata. In the following pages only the better known springs in the county are described. There are numerous others, warm and cold, especially in the eastern and southeastern plains region, which are of value as watering-places for stock and for domestic supply, but not of particular interest to the ordinary reader.

Budan Spring, Mrs. E. Budan, San Luis Obispo, California, owner, is located 6 miles south of San Luis Obispo on the Pismo Road in what would be Sec. 32, of T. 31 S., R. 12 E. if the grant were divided according to the public survey. This is, properly speaking, an artesian well, it having been brought in during 1908, while boring for oil. The water issues under considerable pressure and there is a flow of possibly 5 miner's inches, although no measurements have ever been made. The temperature of the water is given as 178° Fahrenheit; it is too hot to be borne by the hand. The flow is through an iron pipe 3' above the ground and the water domes up over this noticeably. The equipment at present consists of 3 tubs for bathing, to which the water is conducted directly from the well.

There are no accommodations for guests and the patronage is local, but additions are contemplated. The water is markedly but not disagreeably sulphuretted and the temperature is higher than at any other spring in the district. There is no reason why a little resort should not be profitable here.



Budan Spring, San Luis Obispo County.

Grand Central Sulphur Spring, E. J. Burlingham, Paso Robles, California, owner. In 1911 a well was started in a search for the warm sulphur water, which was known to exist in great quantity under the town. At a depth of 510' a strong flow of the liquid resulted. The well is fitted with an 8" casing and is capped to prevent waste of the water, the owner stating that the pressure exerted by the water is 45 pounds per square inch at the outlet. The property is located in the center of Paso Robles and is well fitted up for use by the public, the bath house being equipped with 11 tubs, hood sweat, mud bath, and other accessories. Considerable merit is claimed for the water, especially in the treatment of rheumatism and

stomach complaints, and a fair-sized business is done. The analysis of the water is shown in the appended table.

Huer-Huero Springs consist of 2 distinct groups. The northern group, the water of which is sulphuretted, cold, and carries some iron, is 13 miles southeast of Paso Robles and $1\frac{1}{2}$ miles south of Creston, and is well liked as a camping ground. The New Springs are 2 miles farther south and yield a flow of 2 to 3 gallons per minute of "iron" water strongly sulphuretted. E. H. Ashwood owns both.

Cameta Warm Spring is located near the side of the Bakersfield road about 30 miles southeast of Paso Robles. The flow reported to be about 3 gallons per minute and the temperature 74° F. The spring is resorted to a little by local people who have piped the water to a shed nearby where they use it for bathing.

Bibl.: U. S. G. S. Water Supply Paper 338, p. 77.

Kessler Springs are located at the Kessler Onyx Quarry in Secs. 9 and 16, T. 31 S., R. 15 E., and are noteworthy because of the mineral deposits which have resulted from precipitation of the salts which they contain. The flow of water is small and the temperature about 60° F. Besides the carbonated spring there are some small saline springs here which during the dry season are noticeable on account of the small crusts of common salt which are formed in the creek bed. These springs are located 20 miles northeast of Arroyo Grande and are the property of the Kessler Estate. They have never been utilized.

Bibl.: U. S. G. S. Water Supply Paper 338, pp. 164-165.

Municipal Baths Springs, located in Paso Robles and operated under the supervision of the city, get their supply from an artesian well 392' deep with a 6" casing. The flow of the well is stated by those in charge to be 380,000 gallons in 24 hours. No analysis of the water has been made as far as could be learned, that given in the literature being the same as the analysis of the "Main Sulphur Spring" published by the Paso Robles Hot Springs. The assumption that the waters are practically the same is reasonable, however, as the two wells are only a few hundred yards apart; it may be noted, though, that there is considerable difference in the depths of the two wells. The water at the Municipal Baths issues at a temperature of 108.6° F. and no use is made of the surplus which remains after supplying the resort.

The establishment is very substantial and elegant throughout, both in architecture and interior appointments. It is fitted with 12 porcelain tubs for hot sulphur water baths; 3 set-in tubs for hot mud baths, a plunge, and packing, cooling, and waiting-rooms for both

men and women. The building is of concrete, and the plant is valued at \$25,000. A force of 4 men is employed and a gross business of \$4,000 to \$5,000 per annum is reported, regular courses of treatment being given. The waters are held to be especially efficacious in treating nervous, liver, and rheumatic trouble.

Newsom's Arroyo Grande Warm Springs are situated on the ranch of the Newsom Estate in T. 32 S., R. 13 E., $2\frac{1}{2}$ miles east of Arroyo Grande. In 1864 D. F. Newsom, father of the present occupants, located the land as a homestead, but for a long time previous to that the waters had been resorted to by the Indians, who used them medicinally.



Municipal Baths, Paso Robles, California. Owned and operated by the city of Paso Robles.

The spring rises from the bed of the arroyo and yields about 15 gallons of water a minute at a temperature of 100.5° F. The water carries sensible amounts of iron, which is found in greater quantity in all the springs of this section than in those around Paso Robles. The establishment includes a small hotel, 6 cottages and the bathing equipment, which consists of 5 tubs and a small plunge. There are spacious and pleasant camping grounds, and in the summer and fall the resort is visited a good deal by families who camp out.

Bibl.: Winslow Anderson's "Mineral Springs of California," p. 207; U. S. G. S. Water Supply Paper 388, pp. 68-69.

Paso Robles Hot Springs, is one of California's finest health and pleasure resorts and has become very widely known. The main sulphur spring, as it is called, is a well 640' deep, with a 10" casing and an enormous flow of warm, sulphuretted water, which supplies the needs of the resort. The hotel and other buildings are situated in spacious grounds in the western part of Paso Robles. The establishment is



Newsom's Arroyo Grande Warm Springs Resort, San Luis Obispo County.

completely equipped in every respect for the entertainment of guests; and for the treatment of the ailments which the mineralized waters are said to alleviate. There is a large plunge and a varied equipment of the most modern apparatus to be found at any resort, and there is kept in attendance a number of skilled operators who administer hot air and vapor baths, massage, exercises, and other courses of treatment to supplement the work of the mineral waters. The plant is valued in excess of \$250,000. It is situated almost midway between Los Angeles and San Francisco on the Southern Pacific Coast Line, with very good train service, excellent climate and other advantages, which have made it extremely popular. The flow of the main spring is stated to be 2,000,000 gallons per day and the temperature of the water is 107.6°. There are several natural springs about 2½ miles north of the hotel and these are operated under the same management, being known as the Paso Robles Mud Baths.

Bibl.: U. S. G. S. Water Supply Paper 338, pp. 72-75.

Paso Robles Mud Bath Springs. These are situated near the Southern Pacific tracks and within 100 yards of the Salinas River. There is a new concrete bathhouse, equipped with packing rooms

and 12 concrete dips built into the mud springs and showing the constant ebullition of gases and mineral waters rising through the mud in the basins. The temperatures of the springs here vary from 104° to 122° F. The mud is the characteristic black tule material and there is spring activity apparent in it in other spots near the bathhouse. The water of these springs, as will be noted from the analysis, is markedly different in mineral content from that in the Paso Robles wells, showing particularly a much higher sulphate and chloride content.

Adjacent to the bathhouse is a 4" well, 140' deep, yielding a small flow of water at a temperature of about 118° F. This is named the Lithium Spring and is capped and used for drinking. Seventy-five yards away is the Soda Spring, which is a natural spring flowing four



Paso Robles Hot Springs Bathhouse, Paso Robles. Photo by C. A. Waring.

gallons a minute of water at a temperature of 77°. This water is artificially carbonated and bottled by the soda works at Paso Robles.

Bibl.: U. S. G. S. Water Supply Paper 338, pp. 73-76.

The Iron Spring (Paso Robles) is in a little cañon about 200 yards northwest of the bathhouse. The flow is small, hardly a gallon a minute and is utilized for drinking. Its temperature is only 64° F and it carries a little more iron than the other springs. The advertising matter credits all these springs with radio-active properties and special virtue is claimed for them in treating rheumatism.

Bibl.: Winslow Anderson, p. 123.

Pecho Warm Springs are due west of San Luis Obispo in Islay Creek, 2 miles from the ocean. The water is strongly sulphuretted; one spring has a temperature of 95° F., the other 72°. The total flow

is possibly 20 gallons per minute including that of a third small spring about $\frac{1}{4}$ of a mile away. These springs have been used locally for many years, but are unimportant.

Bibl.: U. S. G. S. Water Supply Paper 338, pp. 69-70.

San Luis Hot Springs, were formerly known as Sycamore Springs. They are owned by C. A. Griggs and are located 6 miles south of San Luis Obispo, being reached most conveniently through that city by auto stage. The flow of water was obtained from a well bored in search of oil. The endeavor to find this was abandoned in 1887 when the well had reached a depth of 937', at which point a copious flow of hot sulphur water and gas resulted. Statements of the rate of flow are found, which credit the well with 144,000 gallons of water and 16,800 cubic feet of gas per diem, but these figures are no doubt high for present production, although gas still issues in considerable volume. The water has a temperature of 110° F.

The establishment is quite extensive and is located in pleasing surroundings, close to the coast but protected by steep hills, and offering every access to some of the most striking coast scenery in the state.

There is a hotel which has been recently refitted, a dance hall, cottages, and tenting grounds. Two plunges are provided for hot sulphur baths and there are over 20 tubs; the owner taking particular pride in those made of solid porcelain, of which he has 10 weighing over 1000 lbs. each. Mr. Craig promises other improvements in the near future.

Santa Ysabel Springs are located on the land of the Santa Ysabel Hot Springs Land and Water Company, at a distance of 4 miles southeast of Paso Robles. There are 2 springs at the bathhouse and some lesser ones farther up the cañon. Of the 2 principal springs, the larger flows about 220,000 gallons per diem and the water issues at a temperature of 94° F. The smaller one rises within a concrete basin and has only a small flow. There is a small bathhouse over the spring and the local people make some use of the water. From the spring the water flows into a storage reservoir and is utilized for irrigating a large surrounding acreage.

Bibl.: Winslow Anderson, p. 233. U. S. G. S. Water Supply Paper 388, pp. 76-77.

PETROLEUM.

There has been a great amount of unsuccessful drilling done in this county in search of oil. Such wells as did strike oil have made a small production of material so high in asphalt that pumping has been required. Much money would have been saved and many disappointments would have been obviated if more attention had been

paid to the geology of the county with reference to conditions affecting the possible location of underground oil reservoirs.

As the geology of the various oil districts and the present condition of the industry have been fully covered in the recently published Bulletin No. 69 of the California State Mining Bureau, it is not necessary to do more here than refer the reader to that publication and to the others noted below.

Bibl.: State Mining Bureau Bull. 19, p. 146; Bull. 69, p. 418 and pp. 429-434; R. VII, pp. 97-99; R. VIII, p. 530; XII, p. 356.
U. S. G. S. Folio 101.

QUICKSILVER.

Cinnabar from the Sierra Santa Lucia had been used by the Indians for pigment for generations before the miner first sought it. In 1861 active search by prospectors began and the first location is said to have been made in 1862. The usual rush of miners followed and many claims were taken up. The county became an important producer in 1876, but, although many properties are mentioned as yielding, the records give only the individual outputs of the largest, so that we have no means of arriving at anything like an exact idea of the total output. At the properties, too, no systematic data was kept and hardly a person is now to be found who can give first-hand information concerning past operations.

With the exception of the Rinconada Group, all the mines which have produced quicksilver are located along the Santa Lucia Range from San Carpojoro Creek in the northwest corner of the county, to the middle of T. 27 S., R. 10 E., a distance of about 30 miles. All except the Oceanic and Polar Star are at elevations of over 1000'.

The mines on the western slope of the mountains depend on small coast-wise steamers, which touch at San Simeon, to meet their transportation requirements, which are, however, not very exacting, as they ship quicksilver only once or twice a month. There is also a good road to San Luis Obispo. The properties around Klau and Adelaide reach the outside world through Paso Robles, which is about 15 miles west. Although the Santa Lucia is not what would be termed a high range of mountains, the grade over it here is steep and winding, and there is very little travel between Cambria and the eastern slope.

The mines may be roughly grouped in two classes, depending on the character of ore; to the first class belong the properties like the Oceanic, which exhibit sedimentary formations impregnated with cinnabar and carrying high percentages of pyrite; the other group has ores which are highly silicified metamorphics (including serpentine).

The nature of the ore occurrences in most of the mines, and the extreme instability of the quicksilver market in the past, have no

doubt been the chief factors in determining the ruinous policy of exploitation—it can hardly be called mining—which has been followed at a number of the properties visited. The approved method of procedure has been to find a rich pocket of ore, erect a wasteful retorting plant and burn high-grade ore only. The result has not been generally realized, perhaps, until the recent phenomenal rise in the price of mercury. Many owners find now to their chagrin that they have neither high-grade ore bodies rich enough to pay for retorting, nor furnaces to treat the numerous occurrences of low-grade material. Consideration of the costs entailed, and the length of time for which capital would be tied up in erecting and bringing a furnace plant to the producing stage, furnish ample explanation for the lack of activity in mercury mining, in spite of the alluring prices now ruling. It is estimated that the cost of furnace and condenser plants is about \$1000 per ton of capacity, and \$50,000 may therefore be taken as the outlay needed to bring a 50-ton plant to the producing stage. Exact figures of cost are not given freely as a rule, even when available. An additional \$10,000, however, may be required to take care of cost of mining equipment, buildings, monthly mine payrolls, fuel, and other supplies, as well as interest on investment, during the period of furnace construction which may easily be 6 months, before a pound of mercury is recovered.

The inquiry for other means of operating on low-grade ore without such outlay of money and time, has directed attention to the possibilities of concentration. Experience in the past few years at certain California properties has shown that concentration is feasible under favorable circumstances. If the cinnabar occurs in a soft gangue, and crushing to a comparatively coarse mesh is used instead of fine grinding, there will be a fairly good recovery possible, as at the Oceanic Mine, described on another page. At the Oat Hill Mine in Napa County, as mentioned in a recent publication³ of this bureau, old dump material is being concentrated at a very low cost because the ore is well weathered and requires no crushing; no estimate is given of the values lost in the coarser material, which goes through the sluice. Less favorable conditions are found at the Aetna Mine in Napa County, where it has been observed that a hard gangue and finer grinding result in considerable loss in the slime. It may also be observed that a low-grade ore carries the cinnabar, as a rule, in such a floury or finely crystalline state that considerable loss in the fines is possible without the grinding.

Retorting of concentrates is not very satisfactory as provisions have to be made to prevent packing and retorts are usually very

³Mines and Mineral Resources of Napa County, W. W. Bradley, 1915.

wasteful of mercury and costly to operate. It is very easy to burn out a set of pipes or lose all the mercury in an ore, by keeping too hot a fire. It can not be denied that the Scott furnace is still the best means of recovering mercury. Improvements in its use are going to be along the line of evolving better condenser systems and reducing fuel used and soot produced. Men of wide experience in the industry freely admit that they do not seem to be able to recover anything like the values indicated in numberless assays of their ore, nor are they prepared to say whether the lost values get away as mercury vapor, as minute particles of condensed mercury, or as part of some chemical combination.

Alice and Modoc Group (see Little Bonanza).

Bank Mine (see Cambria Mine).

Belt Quicksilver Mining Co., Rev. Mr. Buley, Paso Robles, California, president; office 912 Baker-Detwiler Bldg., Los Angeles. This company has a lease on the old La Libertad Mine, which is situated in Sec. 21, T. 27 S., R. 10 E., about 20 miles west of Paso Robles, at an elevation of 1900'. A great deal of work has been done here in the past, development having been carried on through 3 tunnels. Several large bodies of ore were stoped out. The company's report of March 1, 1915, states that there are 1000' of drifts, raises and stopes. The work underground reveals an irregular ore body dipping at different angles, which had a width of 20' to 25' and has been worked by stopes of 40' to 60' in length. New work has been done in driving a crosscut 12' long off the lowest drift. The face of this cut shows some ore. The cinnabar is in the form of small crystals with silica in a highly metamorphosed rock which has been classed as serpentine, but which owes its present vivid green coloring to ferrous sulphate and which shows a rather soft clayey texture. The ore is near the contact with a dark clay footwall which carries sandstone in small rounded boulders and shows calcite stringers, as well as the characteristic epsomite efflorescences. The reduction equipment consists of a 12-pipe retort, in good order, and at the mine 3 ore cars and 700' of track to the retort.

Bibl.: S. M. B. Bulletin 27, p. 159.

Cambria Quicksilver Mine, formerly known as the Bank Mine and owned by the Cambria Quicksilver Co., of Los Angeles, located in Sec. 36, T. 26 S., R. 8 E., 13 miles north of Cambria by road and 11 miles from San Simeon, the shipping point. The holdings consist of mineral rights on 360 acres.

This mine made a good reputation as a quicksilver producer between 1905 and 1908. The mine was first exploited in 1903 by E. S. Rigdon. The surface showings were quite poor but exploration under ground revealed an ore-body of considerable size, and quite

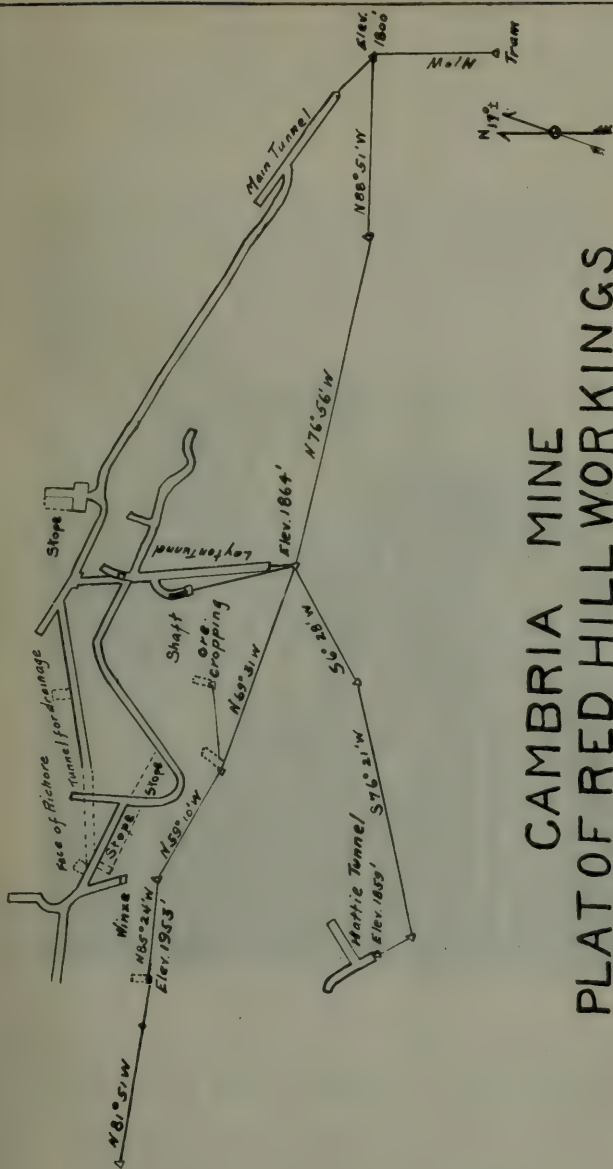


Reduction Works, Cambria Quicksilver Co., San Luis Obispo County. Photo by E. W. Carson.

rich. The present company obtained the property in 1905, but they carried development work for a year before erecting a reduction plant. A tunnel 800' long was driven to use in handling the ore and from this a cut 200' long was driven into the ore-body which proved to be very flat and to consist of a zone of brecciated serpentine about 40' thick, dipping northeast. When the company had carried development work underground to the point where they were convinced of the value of the ore body, they erected a furnace. During the 18 months ensuing, operations were very satisfactory. An ore body 180' long, 40' wide and 150' in height was worked out by stoping and yielded 3927 flasks. Square setting was used but notwithstanding this the cost of production per flask was very low, being stated as \$26.03. A very good recovery was made estimated at 85% to 90%; the ore carrying little or no iron sulphide and giving little trouble in the furnace. Early in 1908 the ore gave out, the body apparently being cut off either from faulting or sliding. Operations were suspended till the fall of 1915 but the same company remained in charge.

The owners and superintendent were of the opinion that the ore-body they had worked was a portion of a larger mass from which it had been broken, and there were certain observed conditions which seemed to confirm this. Accordingly, the latter year, vigorous prospecting began on a series of croppings north of and slightly higher than the old mine. Up to the time of the writer's visit, about 1400' of new drifts had been driven on two levels and crosscuts totalling over 400', as well as about 300' of raises and winzes, had been put in. Considering that all this was done by hand drilling, and was at times in heavy ground, it is a good showing. The croppings, which show on the surface for 700' have been followed underground for half that distance. Superficially a rather flinty and ocherous cropping, the appearance underground is that of an intensely brecciated serpentine carrying small stringers of rich ore in a siliceous gangue, and coatings of cinnabar on the serpentine fragments. The mineralized zone as revealed at that time was about 20' in average width, with a dip of about 40° N. and a strike of few degrees north of west. Throughout its width prominent streaks of dark clay selvage occur, and in places form an "alta," but the country rock is serpentine on both sides. As already noted, the ground is heavy, and carries a good deal of water in places, as might be expected. Square setting with round timbers is employed and pretty close lagging is needed at times.

The furnace was put in operation in the summer of 1915 on surface ore of low grade from the croppings, but considerable difficulty resulted. The rock was clayey, highly altered serpentine, carrying considerable water. It seemed to Mr. Carson as if the clay held the



CAMBRIA MINE

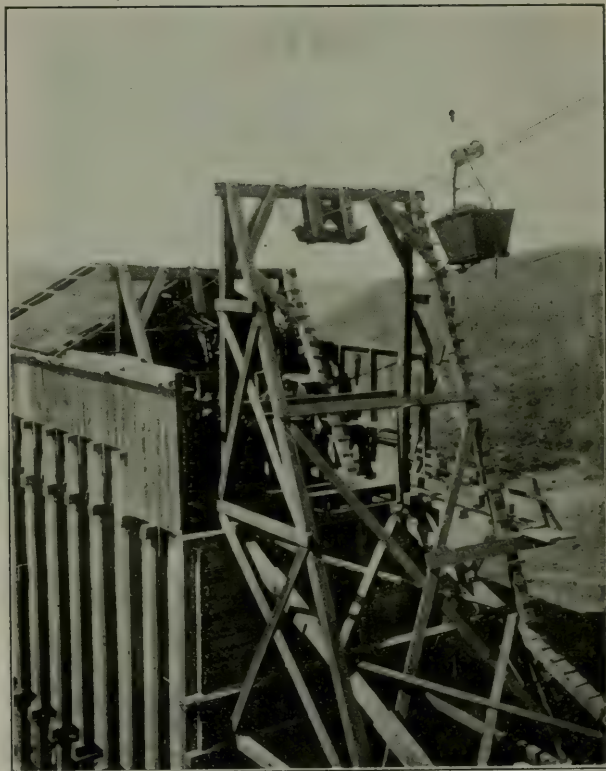
PLAT OF RED HILL WORKINGS

Section 36 T 26 S R 8 E

Scale: 1 in = 150 ft.

Drawn by C.A. Logan

mercury after the decomposition of the cinnabar, and the degree of heat necessary to expel it was such that the values were driven through the entire condenser system and lost. That this condition really existed, or that the failure to make mercury was due to other causes is open to question and the work was not carried to a decisive point. In October, ore from underground was put in the furnace



Detail of tramway and ore-bin, Cambria Mine, San Luis Obispo County.
Photo by E. W. Carson.

and production began. While not approaching as yet the grade of the old ore-body, some encouraging developments are reported for December, 1915.

The reduction equipment includes a 70-ton Scott furnace and 8 brick condensers in good condition, one "D" retort, and an 8" x 12" Hercules Blake crusher. From mine to crusher the ore is hand-trammed in one-ton cars. Storage equipment consists of two bins

with a total capacity of 1500 tons. To carry the ore from crusher to storage bins, a Broderick and Bascom two-bucket tramway system has recently been completed at a cost of \$6,000. This handles the ore for a distance of 3000' at the rate of $6\frac{1}{2}$ tons an hour and dumps into the upper ore bin from which it is trammed to a lower bin and to the furnace.

The ore is roasted 36 hours at a considerably higher temperature than at the Oceanic Mine. The furnace and condensers are in excellent condition; the air is excluded as much as practicable from the furnace and in this way the formation of an excessive amount of soot is avoided. The operators believe that the longer roasting period gives more satisfactory results.

Labor is cheap; miners get \$2.50 and muckers \$2.00 per day. Total cost of mining, including overhead, in 1907, was \$1.66 per ton; but it must be borne in mind that the cost of square set timbering adds largely to this item. A considerable increase in the cost of timber is noticeable in 8 years. In 1907, lagging cost \$8.00 to \$12.00 per thousand; they now cost \$20.00. Timber which was then obtainable for $3\frac{1}{2}\phi$ to 5ϕ a running foot, now costs 6ϕ . These advances and other slight increases in transportation will bring the present mining cost to about \$2.00 per ton. Treatment cost \$0.82 per ton, but this figure should be somewhat reduced under present conditions. Oakwood costs \$6.00 per cord delivered, and the furnace burns $1\frac{1}{2}$ cords per diem. The retort burns $\frac{1}{4}$ cord per day for about 7 days per month when the furnace is working steadily. Other general expense, aside from superintendent's salary, is 20ϕ per ton, making a total operating cost for the former period of \$2.68 per ton, and for the present of \$3.00 per ton. Transportation to or from San Simeon, the shipping point, is \$5.00 per ton.

Power for the train and the rock crusher is furnished by an Otto gas engine of $12\frac{1}{2}$ h.p., burning distillate. The cost per horsepower-hour is stated at $1\frac{1}{2}\phi$. The rock crusher requires two-thirds of the power generated.

The total crew employed in November, 1915, was 34; 22 worked underground and 4 on top at the mine, and 8 were required at the furnace.

Bibl.: Bull. 27, p. 154, Bank Mine.

Capitola Quicksilver Mine. Lane, Pemberton, and Villegas of Klau, owners; W. W. Walker, San Luis Obispo and Geo. T. Liddle, Paso Robles, lessees. Adjacent to the Klau Mine in T. 26 S., R. 10 E.; about 15 miles west of Paso Robles. This property has been slightly explored by means of a tunnel about 100' below the outcrop. At a distance of 300' from the portal the work ceased, with the face of the tunnel exposing an ore-body of peculiar nature. The rock is sedi-

mentary, dark gray, and of clayey texture, carrying pyrite crystals as large as $\frac{1}{2}$ " on an edge, often in aggregates of several inches in diameter where the crystals are interlaced. This body carries some cinnabar in the clay but there has been no work yet done to determine its extent.

The country rock is clay and sandstone with inclusions of sandstone and calcite, as shown in the drift. The outcrop is highly ocherous and does not show any cinnabar to the naked eye, but is stated to pan 0.25% quicksilver. The croppings show the usual northwest strike.

The reduction plant consists of a 24" "D" retort with a capacity of 1000 pounds per day, and two concrete-covered condensers 4' x 4' x 6'. The very high pyrite content of the ore then exposed would necessitate extreme care in reduction, to avoid too high a temperature and consequent loss of mercury through failure to condense it, or through its recombination with sulphur to form artificial cinnabar. Since the writer's visit to this property, work has been resumed there by the lessees and the construction of a new retort is planned.

Claus Group, of four claims, is owned by C. P. and Cecilia Claus of Santa Margarita and is situated in Sec. 28, T. 30 S., R. 14 E., 11 miles southeast of that town and adjacent to the Rinconada Group. Claim No. 1 covers the old Pedro which has been prospected considerably, and Claim No. 4 has a 75' tunnel which shows a promise of ore. The geology of this district is well covered in a previous report dealing with the Rinconada Group, where developments justify more work. At the time of the field work for this report the assessment work was being done and some ore was being taken from near the surface and hauled to the pipe retorts on the Rinconada claims. This retort will be used if the ore on the Claus claims proves of retorting grade.

Bibl.: See Rinconada Group, Bull. 27, p. 166.

Cypress Mountain Group, W. S. Torrington, Paso Robles, California. There have been no new developments at this property, although assessment work is being done from year to year. The claims are in Secs. 1 and 2 of T. 27 S., R. 9 E., about sixteen miles from Cambria. All the work done in recent years has been of a superficial and desultory nature, and the old workings are mostly caved. Elevation, 2900 feet.

Bibl.: Bull. 27, p. 156.

Doty Group. Doty Bros. of Cambria, owners. The holdings comprise 5 unpatented claims in Sec. 14, T. 26 S., R. 8 E. A tunnel about 200' long has been driven in a black clay gouge without result, although indications of cinnabar are mentioned in a former report. There is no reduction equipment.

Bibl.: Bull. 27, p. 156.

Elizabeth and Winona Group, comprises two locations held by Mrs. J. W. Bagby and others of Paso Robles, and is situated in Sec. 17, T. 27 S., R. 10 E., at a distance of 13 miles from Cambria. The claims lie between the Little Bonanza and the Belt properties, and exhibit similar croppings to those of the former. The work has



Outcrop and tunnel, Doty Mine, San Luis Obispo County. Photo by E. W. Carson.

been superficial, and in the past few years has been entirely suspended, although some prospecting was contemplated in the fall of 1915. There was a small production years ago but the 10-pipe retort is no longer usable.

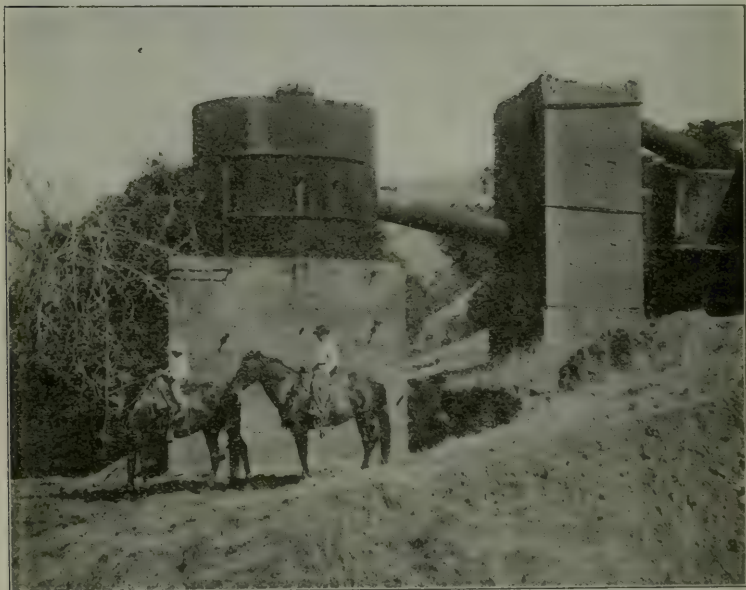
Bibl.: Bull. No. 27, p. 157.

Karl Mine (See Klau).

Keystone Mine is on patented land belonging to Phelan Bros. of Cambria, and is situated on the flank of Rocky Butte, in Sec. 13, T. 26 S., R. 8 E., 16 miles east of San Simeon by road. This property was located in the early seventies and has been credited in former reports with considerable production. The furnace and condensers, shown in the photograph, were completed late in 1874 and the mine produced about 60 flasks of quicksilver in 1875, according to the best information obtainable, but no one is accessible who has

first-hand knowledge of the work done. This is said to be the only production of which there is a record. The property has been idle ever since.

The furnace is of the old coarse-ore type of 5-ton capacity and there are 6 of the sheet-iron condensers. The whole plant is quite an interesting relic, as most of such equipment has long since disappeared. The underground workings consisted of a tunnel said to have been about 300' long with a winze sunk from it to a depth of 50', but both are inaccessible. The statement is made that the winze was in good ore when work was abandoned. The outcrop shows



Old coarse-ore quicksilver furnace, erected 1873. Keystone Mine, San Luis Obispo County.
Photo by E. W. Carson.

cinnabar in highly altered serpentine, with a black clay "alta" and a serpentine footwall, striking E., and dipping 40° N. In November, 1915, the mine was under option, but it is hardly likely that any deal will be made at the price asked.

Bibl.: Report X, p. 581; MIN. RES. W. OF ROCKY MTS., R. W. Raymond, 1875, p. 14.

Kismet Group. Idle.

Bibl.: Bull. No. 27, p. 159.

Klau Mine, known forty years ago as the Sunderland, and more recently as the Karl or Sierra Morena, has produced considerable quicksilver during different periods of activity. The property owned includes three claims and a mill site, as well as the mineral rights on adjacent land. It is in Sec. 33, T. 26 S., R. 10 E., at an elevation of 1400' on the eastern side of the Sierra Santa Lucia, 16 miles west of the nearest railroad station, Paso Robles. The original location was made in 1868 and it was among the list of producing quicksilver properties in 1874, but no definite record of output is available till 1876, when the mine yielded 1590 flasks of mercury with a furnace of only 15 tons daily capacity. Total recorded production from 1876 to 1879 was 2777 flasks.

No further output is recorded till 1895, although development work was going on for several years previous, the failure to strike ore being due to ill-advised mining methods, according to local report. Intermittent work was done without very much production till 1901. In the following year the Klau came to the front, being the fourth largest producer in the state and the chief mine of the county in point of output. The county's mercury production that year was 3312 flasks, and the larger portion of this came from the Klau, as the Oceanic furnace was not started till the fall of the year. Work continued, with an 8-tile, 60-ton Scott furnace and 8 condensers till 1908, in which year the production was made from cleaning out old condensers. Another period of inactivity ensued. In 1911 the wooden structure over the furnace and condensers was burned; no production was made during the next three years.

The geology of the mine was fully covered in our Bulletin No. 27. In view of the careful examination made by the writer of that report, and the inaccessibility of many of the old workings, which have been abandoned for years, as well as the lack of time, the present writer did not attempt an examination underground. It is stated that the inclined shaft reached a depth of 800' and that a large amount of drifting and crosscutting from the shaft failed to reveal ore. These workings became so extensive that a raise to the surface was required to give ventilation, and in the course of putting this through, the best ore-body ever found in the mine was uncovered.

In 1915 the property was leased to George Herring of Paso Robles. The work he did during the year was all superficial. He devoted his attention to searching for small, rich pockets along the top of the croppings and was successful in finding several such, from which the ore was broken and hand-sorted, the richer material being hauled on a sled to the retort. This method of handling brought the total cost per ton up to about \$6.00, but the picked ore was so good that a

net operating profit as high as \$28.00 per ton was realized, some of the best rock going $1\frac{1}{2}\%$ mercury.

Besides the furnace, there is a 13-pipe retort which was used by the lessee. This has a capacity of $2\frac{1}{2}$ tons of ore and requires $\frac{3}{4}$ of a cord of oak wood in 24 hours. Wood for fuel is abundant near at hand and costs \$4.00 per cord delivered at the retort. Six men were employed at \$2.00 to \$2.50 per day each.



Furnace and condensers, Klau Quicksilver Mine, San Luis Obispo County.

The outcroppings are prominent and have been followed for half a mile. Where work has last been done they show a strike a little N. of E. and dip 40° to 50° S. The surface ore is highly siliceous, in contrast to that taken from underground which was clayey and highly pyritiferous, and apparently dipped northeastward, according to old reports. There is undoubtedly a large tonnage of ore in this property which would pay for extraction and furnace treatment. It

will probably be necessary to spend considerable money to unwater the shaft and reopen the old workings if it is desired to use them again. The furnace might develop weakness on being fired up after such a long exposure to the elements.

The property has been sold for \$15,000, since the above report was prepared, to E. S. Rigdon and others, of Cambria, and Wm. Bagby of Paso Robles.

Bibl.: Reports X, p. 580; XII, p. 366; XIII, p. 600; Bulletin No. 27, p. 157. U. S. G. S., Monograph XIII; Mineral Resources 1876 et seq., 1902; 1906, p. 492; 1908; 1910; 1912, p. 943; MINING & SCIENTIFIC PRESS, Nov. 12, 1904.

La Libertad (see Belt Q. M. Co.).

Lehman Mine. Located in Sec. 13, T. 27 S., R. 9 E., 12 miles from Cambria and owned by F. Lehman, Cambria. The development consists of a tunnel nearly 200' long which, when visited, had uncovered no ore of value, although some promising indications are reported for the subsequent month. One man was employed driving the tunnel.

Bibl.: Bulletin 27, p. 161.

Little Bonanza Group, comprises the celebrated Josephine; the first quicksilver mine worked in the county. Of late years the property has been known as the Alice and Modoc and has been described at some length in Bulletin No. 27 of this bureau. Two patented claims are in Sec. 17, T. 27 S., R. 10 E., about twenty miles east of Paso Robles and near the top of the Santa Lucia divide, at an elevation of 2000'; R. W. Putnam, San Luis Obispo, owner; E. S. Rigdon and E. Bianchini, Cambria, lessees.

The original discovery is said to have been made in 1862 by Mexicans. The temporary closing of the New Almaden Mine prompted the purchase of this property by Messrs. Barron & Company. Considerable money was spent in development and an 8-ton furnace was put up. An adverse report on the property by its superintendent, and the reopening of the New Almaden, led to the abandonment of the Josephine. Later work, however, disproved the fanciful theory of the superintendent that the earth's heat had expelled all the mercury in the ore. Several bodies of ore have been worked out by stoping; two in particular showing a thickness of 10', but little has been done since the work described in our Bull. 27.

The present lessees have put the 12-pipe retort in order and at the time of the writer's visit had already reduced several flasks of quicksilver. The ore was being taken from some of the old workings which had not been exhausted, particularly from the bottom of one of the lenses, which showed some very good indications. The cin-

nabar occurs as crystals in a gangue of mixed carbonates of magnesium and calcium which is highly silicified.

There are two newly observed ore croppings which have been found since our visit; one 60' west of the upper stope and one 600' west of the lower open cut. The lessees have begun prospecting these with the hope of uncovering new lenses of workable quality.

Bibl.: R. X; Bull. 27, p. 154; MIN. RES. W. OF ROCKY MTS., Raymond, 1875.

Madrone Mine. John Carmine, Cayucos, California, owner. This is in Sec. 22, T. 27 S., R. 10 E., adjacent to the Belt quicksilver mine. It was worked about 1900 and considerable mercury recovered by retorting, but no depth was attained in any of the operations. The croppings are not particularly different from those in the Belt or Little Bonanza. Some small rich bunches of ore are present both in the characteristic siliceous gangue and in a softer ocherous material, and the wall rocks are similar to those in the two properties above.

In addition to the mineral found in place, there are several bodies of material scattered over the property where free mercury can be panned out. It is found in the loose incoherent soil and must be the weathered product of a one-time outcrop. Samples of this, taken from several places by Mr. Merrifield, the former superintendent, gave from $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds of mercury per ton in the retort. There would seem to be justification for more extensive work on this property.

Bibl.: Bull. 27, p. 161.

Mahoney Mine is situated in Sec. 33, T. 26 S., R. 10 E., 14 miles west of Paso Robles at an elevation of 1140'. Miss Mary O'Tool of San Jose is the owner. The tunnel is said to be 400' long but was inaccessible when visited on account of water. Recently leased to P. A. H. Arata and R. W. Putnam of San Luis Obispo.

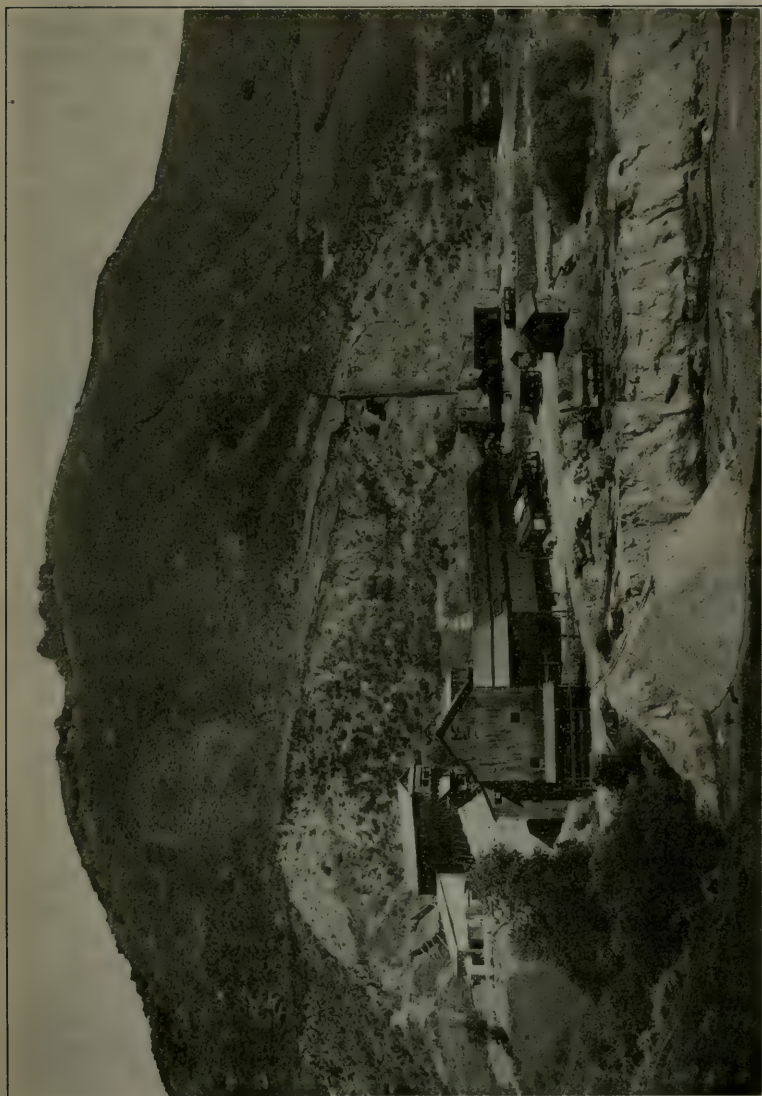
Bibl.: Bull. 27, p. 161.

North Star Mine. Idle for years.

Oceanic Mine is 5 miles from the town of Cambria and comprises three patented claims containing 60 acres, as well as the mineral rights on 400 acres of adjoining land. The property is in Secs. 15 and 21, T. 27 S., R. 9 E., on Santa Rosa Creek and owned by Murray Innes, who is in personal charge of operations at the mine.

The patent for the three original claims was granted in 1865 and was signed by President Lincoln. The mine has an interesting and instructive history.

In 1872 it was taken hold of by a corporation who began developments on a very ambitious scale. A large force of men were hired and 600 acres of timber land purchased. Seven tunnels were driven up in 1874-75. First recorded production occurred in 1876, when the



Reduction plant and mill, Oceanic Quicksilver Mine, San Luis Obispo County. Photo by courtesy of Murray Innes.

yield was 2358 flasks. The metal at this time was worth about \$1.50 per pound and the quicksilver mining industry was at the highest pitch of prosperity which it has ever enjoyed previous to the present war-boom. During the period of 1876-1879 inclusive, the Oceanic produced 7391 flasks. Sharp declines in price, however, brought quicksilver to less than 40¢ a pound in 1882 and left only 6 mines in the state which could produce without loss.

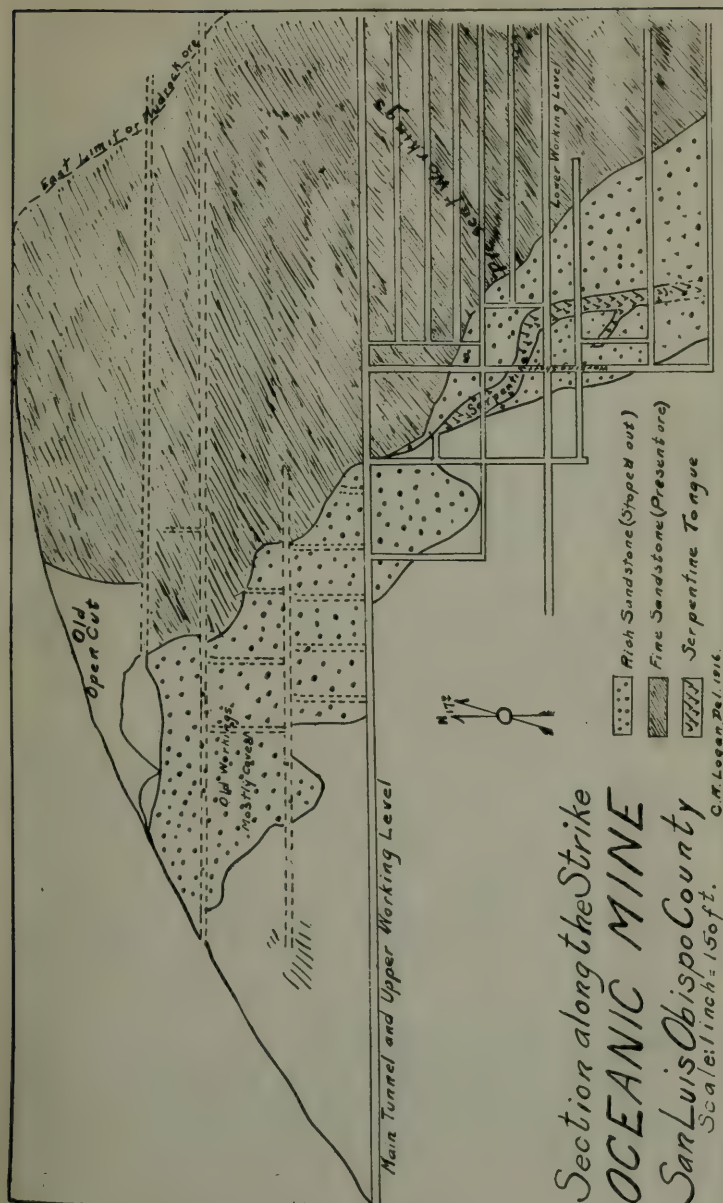
The Oceanic had practically closed down three years before, and remained idle till 1902, when a new company assumed ownership and erected a 50-ton Scott furnace.

Production was resumed soon after, and was maintained more steadily than at any other property in the county. In 1906 the Oceanic was one of the six chief producers in California and in 1908 it is also mentioned as one of the nine leaders, in spite of the depressed condition of the industry. In 1909 and 1910 the mine was operated by lessees and in the latter year was the only producing quicksilver property in the county. About this time the coarser sandstone ore gave out. The rock on the hanging wall side of the old vein (and easterly on the strike) proved, on exploitation, to be a finer-grained material, carrying cinnabar in much smaller percentage than the old ore. It was erroneously named a shale "mudrock." Failure was the result of all attempts and pessimists decided that the mine was worked out.

In 1912, the present owner took control of the property and assumed personal charge of the mine. He had done considerable work in Arizona and his success there with low-grade bodies of copper ore, led him to believe that he could do something with the Oceanic. He rebuilt the furnace and made a small production that year, besides developing an immense ore body of low grade. He had to work on such a narrow margin of profit that cheap mining, high recovery, and low reduction cost were imperative.

Method of Mining.

The method of mining which he used was new to California practice. It is known as sublevel slicing. As used at the Oceanic, two main or working levels have been driven 150' vertically apart along the strike of the ore body for 300'. These are well timbered. At vertical intervals of 25' between the two main levels, sublevels are driven. Mining begins on the far end of the block, where a raise has been cut through. The angle of drilling is such that the ore can fall freely to the lower level, and at the same time permit easy handling of the machines. Holes are driven above and below on a slice and the two rounds of shots break through it, and so on through the block.



The ore is a peculiar fine-grained sandstone of dark gray color which contains enough calcite to cause marked slaking on exposure. It is high in iron sulphides and the cinnabar values are so finely disseminated as to be invisible underground, but if specimens are taken from any part of the ore block, and are reduced on a buckboard and panned, a surprising prospect is obtained. The ore is quite uniform in value. No defined hangingwall has been uncovered; the cinnabar decreases gradually as the stratum is crossed and the hangingwall may be termed a commercial one, its position being determined by the price of quicksilver. At prices prevailing before the European war it was possible to work an average width of 15' to 20'.

At the lower main level the ore is shovelled into cars and hand-trammed to the shaft. This shaft extends vertically 300' below the upper level, but at present is used only for hoisting the distance of 150' to the upper main levels. This level, which comprises 1200' of old tunnel as well as 300' of new work, tops the present ore-body about 300' vertically below the outcrop. Parallel drifts in addition to the 5 sublevels and the numerous crosscuts of 15' each (which are being driven on the sublevels to facilitate operations and furnish alternate chute spaces) add a great deal to the total of underground work.

The ore is trammed by hand 800' to the tunnel portal, where a 9" x 16" Fort Wayne crusher reduces it to 2" size. From here the aerial tramway takes it $\frac{1}{2}$ mile to the furnace, into which it is fed direct, with the exception of the small tonnage concentrated.

Concentration.

The concentration plant consists of a 3 $\frac{1}{2}$ ' Huntington mill and a Deister table. It was originally installed for the purpose of handling wet ores and does this nicely, but at present is being used to increase the capacity of the furnace. It handles 15 tons in 24 hours and yields a twenty-to-one concentrate which contains an average of 80% of the values so that its product adds the equivalent of 12 tons daily to the furnace capacity. The ore is crushed to 14-mesh and does not slime appreciably because of the friable nature of the gangue, which releases the small cinnabar crystals easily. The owner does not claim to be attempting a close recovery with this little plant, but aims rather to make a rough concentrate. The concentrates are sun dried in summer, but for winter, a dryer was being evolved at the time of the writer's visit, which utilized the hot exhaust of the distillate engine. This is later reported to be satisfactory. The concentrates are fed into the furnace daily with the ore, not however all at once.

Furnace and Condensers.

The reduction plant comprises a 50-ton Scott furnace with 7 condensers and a two "D" retort for handling the soot.

The high percentage of iron sulphide in the ore has made many changes necessary in furnace practice, but is not without its compensations. The acid fumes quickly eat away any metal with which they come in contact and cause rapid deterioration of the condensers. Sulphide ores are self-burning and when action is once well started a great saving of outside fuel can be effected. An excess of air is also undesirable as it raises the temperature in the furnace too high and creates a strong draft, with a large excess of soot. Under the usual system of reduction this ore would give a high percentage of loss on account of excessive heat and draft, and the recombination of mercury with sulphur in the fumes, would form artificial cinnabar and sub-sulphides.

Mr. Innes has changed the reduction system from roasting to retorting. The only air which gets into the furnace now filters through cracks. The temperature of the fire box is rather dull red heat and there is barely draft enough to keep the vapor moving, it often being necessary to aid the circulation with a small fire which is located near the stack outlet. The fumes leave the first condenser at a temperature of 180° F.

Two of the brick condensers have recently been replaced by redwood ones. It may be interesting to note here the opinion of Robert Scott, the father of the Scott furnaces. He believes that the failures of the brick condensers in this case is largely due to poor brick, rather than destructive effects of the acid fumes. The redwood has so far proved satisfactory and is believed to cool the fumes much more efficiently than brick. Probably all the condensers here, except the first, will soon be changed to redwood. Very little mercury is saved beyond the fourth condenser. Expansion and rapid cooling are depended on entirely to condense the mercury, all partitions and baffling having been done away with. Another feature introduced by Mr. Innes is a fume trap which closes the top of the furnace, preventing leakage of harmful fumes through the feeding space, and the loss of mercury.

Costs.

Power for mine and mill is furnished by distillate engines of which there are 6, having an aggregate of 114 h.p. The air compressor and hoist are operated by a 40 h.p. and a 25 h.p. engine and at the mill one engine of 21 h.p. operates the Huntington mill and Deister table. The cost per horsepower-year is \$25.00. Labor underground and at the furnace costs \$2.50 per day and 2 foremen are paid \$4.50 each. Forty men are employed; 20 underground and 7 on top at the mine,

3 at the mill and 7 on the furnace, besides 2 foremen. The development has been all in ore and has cost \$2.00 per ton. This figure may be taken as the maximum mining cost per ton. Now that the ore is blocked out and put in such shape that slicing is under way, the cost of mining will be very low, possibly 50¢ per ton, because one machine man can drill and shoot a big tonnage per shift in the soft friable ore. Hammer drills, requiring only one man, make drilling costs low.

The figures given below for concentration and reduction costs apply to conditions as they existed in November, 1915.

Concentration Costs.

Wages of 3 millmen at \$2.50 per day-----	\$7 50
Cost of power (estimated, basis \$25 h.p.-year), 21 h.p. at .068-----	1 43
Total cost to concentrate 15 tons daily-----	\$8 93
Cost per ton-----	\$0.597

This figure has little significance when it is borne in mind that 3 millmen could take care of a tonnage several times as great with only a slight added expense for power.

Reduction Costs.

5 Furnacemen at \$2.50-----	\$7 50
3 Chargemen at \$2.50-----	7 50
1 Foreman-----	4 50
1 Helper-----	2 00
1 Cord pine wood, delivered-----	5 50
Estimated cost of soot treatment per ton of ore, \$0.03; per day's run, 50 tons-----	1 50
Total cost for 50 tons-----	\$28 50
*Cost per ton-----	\$0 57

Bibl.: Rep. IV, p. 336 (table); VIII, p. 531; X, p. 580; XII, p. 366; XIII, p. 600; Bull. 27, pp. 151, 162, 243. U. S. G. S., Mon. XIII., p. 382. MIN. RES. W. OF ROCKY MTS., 1875, p. 14; 1876, p. 20. Mining and Reduction of Quicksilver at the Oceanic Mine, Cambria, Cal., by C. A. Heberlein, A. I. M. E., Bull., Feb. 1915.

Pine Mountain Group. Located in Secs. 3, 10 and 11, T. 26 S., R. 8 E., 11 miles east of Port San Simeon and at an elevation of from 2800' to 3600'. The property was well covered in previous reports by this bureau. There has been no work here for many years. The holdings are now occupied by the cattle ranges of the Hearst estate.

Bibl.: Bulletin 27, p. 163.

Polar Star Mine, comprises two claims, the Polar Star No. 1 and No. 2, located by A. L. Carpenter of San Luis Obispo. The property is in Sec. 13, T. 25 S., R. 6 E., in the cañon of San Carpojoro Creek, 3 miles above its mouth and fifteen miles north of Port San Simeon.

*Cost of superintendence not included, as owner supervises operations. The figures for wood consumption may be figured as including waste and loss, inevitable in using this class of fuel.

The property was worked in 1877 and later by Mexicans, and some good float ore was retorted. Between 1890 and 1900 it was worked by E. S. Rigdon and others, who did some hydraulicking in an attempt to expose a vein. This has not yet been uncovered, although the surface dirt for several hundred feet up the steep hillside is said to carry cinnabar to the extent of 0.1%. The geology has been described in past reports. The writer found no ore in place, but in the creek bed in the center of the claims he found a boulder of over a ton in weight which shows prospects of cinnabar, and some pieces of the ore which were left by the last operators show good amounts of the sulphide. The rock in which the cinnabar makes its appearance is extremely hard being apparently a highly metamorphosed and silicified sandstone. The large boulder no doubt came from either hillside nearby.

Quien Sabe Group of claims, located by Chas. Stilts and J. Rigdon of Cambria is situated in Sec. 14, T. 26 S., R. 8 E., on the west slope of Rocky Butte and near the Doty Mine. Practically no work has been done to hold the claims. The property is fully described in past reports.

Bibl.: Bull. No. 27, p. 165.

Rinconada Mine consists of four patented claims named the San Jose, Rincon, Tres Amigos and Livermore, located in Secs. 21 and 28, T. 30 S., R. 14 E., 11 miles southeast of Santa Margarita. It is sometimes referred to as the San Jose Valley Mine. Mrs. Theresa Bell of San Luis Obispo is the owner.

The property was located in 1872 and in 1876 was equipped with a furnace of the old sheet iron type, with 5 sheet iron condensers. The designer attempted to keep the mercury vapor separated from the fuel smoke, but the only definite result achieved was the salivation of all the furnace employes. It is said that little if any quicksilver was recovered. The plant was abandoned in 1883. When it was reopened in 1897, two benches of 10-pipe retorts each were put up. Some rich ore was treated and a small production was made, no definite figures of which are now obtainable.

The upper tunnel, said to be 75' long, is now caved and inaccessible. Two intermediate tunnels were driven 40' and 25' respectively, and there is a lower tunnel 200' long as well as several small tunnels and open cuts. The geology has been previously described and there has been no recent work sufficient to uncover further points of interest.

The ore so far worked occurred in small rich bunches, at times nearly solid cinnabar. A former employee at the retort states that some ore gave 5 flasks from $2\frac{1}{2}$ tons and in a few cases as much as 65 to 80 pounds were obtained from a single charge in one pipe. Some samples which have been assayed carried a little silver and iron

sulphide with \$2.60 per ton in gold, besides the quicksilver. A little ore has been mined recently and hauled to the retort on a sled, but had not yet been reduced. The capacity of the retorts is $3\frac{1}{2}$ tons per diem. Fuel is easily obtainable nearby.

Bibl.: Bull. 27, p. 166; R. X, p. 581; R. XII, p. 366; R. XIII, p. 531.

Sierra Morena (see Klau Mine).

Sunset View Quicksilver Mine. Idle for years.

Bibl.: Bull. 27, p. 167.

Tartaglia Group, formerly known as the George and Josephine Group, are owned by J. Tartaglia of Klau. This property lies adjacent to the Bell Quicksilver holdings, in Secs. 18 & 20, T. 27 S., R. 10 E. The original discovery was made in 1862. A furnace was erected and the dump indicates that considerable ore was burnt, but there is hardly a vestige of the plant left and no figures of past production are obtainable. The works were all superficial and the ore revealed was similar to that in the Little Bonanza croppings nearby. Only assessment work is contemplated at present. The claims are 20 miles west of Paso Robles, at an elevation of about 1900'.

Bibl.: Bull. 27, p. 157.

Vulture Mine is situated on Vulture Mountain, in Sec. 24, T. 27 S., R. 9 E., 10 miles east of Cambria. The amount of work done has been insufficient to uncover any ore, although there are prospects of cinabar. Since the last report on this prospect, only a little superficial and desultory work has been performed and there was nothing new to record when the writer visited the district. E. S. Rigdon, F. Lehman, and others of Cambria are the owners.

Bibl.: Bull. 27, p. 167.

Warren Ranch, adjoining the Oceanic Mine. Float ore occurs over an area $\frac{1}{4}$ mile wide down a steep hillside from near the summit. Murray Innes, of the Oceanic Mine drove a 60' tunnel into the hill in an effort to find an ore-body in place. Wm. Spargo also drove two tunnels totalling about 200', but no deposit of any value was uncovered in either instance.

William Tell Mine in Sec. 32, T. 26 S., R. 10 E., shows no new development since the last report.

Bibl.: Bull. 27, p. 168.

Wittenberg Mine in Sec. 8, T. 27 S., R. 9 E., has been idle for a number of years.

Bibl.: Bull. 27, p. 168.

SALINES.

Salinas River, from the Spanish meaning salty, was so named because of the saline springs found along its course and near its source.

Soda Lake, or Dry Lake, as it is often called, lies in Carrizo Plain, T. 31 S., R. 20 and 21 E. It contains about 3000 acres, practically all of which have been located by the Consolidated Chemical Company, which has 23 claims. The lake receives the drainage of the Carrizo Plain, a peculiar depression formed by the faulting down of a large district. The salts leached out by the rain water have formed a layer, usually very thin, but in places filling deeper channels. Under this crust is a mud layer containing considerable of the salines in solution, but there has been no work below this to show whether any deeper strata of salt exist or not.

The deposit is principally sodium sulphate, but crystals of bloedite, a hydrous sulphate of magnesium and sodium, which has been found at only one other place in the country, have been identified here. The region has been carefully studied by the United States Geological Survey, with special reference to the occurrence of potassium there; but analysis showed there was only a negligible quantity of it present. There is not much call at present for natural sodium sulphate, although it is used under the name of Glauber Salt in medicine, and on a small scale for making glass, dyeing, and coloring. The price ranges from \$11.00 to \$18.00 per short ton, and has shown no improvement in the past year.

Consolidated Chemical Co. has a plant at Dry Lake for evaporating the saline water and recovering the solid salt. There are several large open tanks and a windmill, as well as other equipment, the original total expenditure having been about \$25,000. Transportation is a big obstacle toward operating here, even if a market should be found. While McKittrick is only about 16 miles away, steep mountains intervene. The amount of salines available have been calculated at over one million tons. The analysis follows as published by the U. S. G. S.:

Insoluble	0.40
Al ₂ O ₃	.04
MgO	1.66
CaO	.45
Na ₂ O	40.50
K ₂ O	.28
H ₂ O	3.65
CO ₂	
SO ₃	46.12
Cl	9.27
	102.37
Less O	2.09
	100.28

Bibl.: Reports, VIII, p. 532; X, p. 563; Bull. 24, p. 136. U. S. G. S. Bull. 280, p. 369; Bull. 540, p. 428.

STONE INDUSTRY.

Many varieties of stone have been used in the county for building purposes and road construction, harbor work and culverts. A large tonnage was required for use on the state highway recently constructed, and the search for material near at hand led to the opening of several new plants within the past year to supply crushed rock, sand and gravel. While the region has a plentiful supply of stone suitable for cutting and polishing, the distance of the deposits from transportation and the lack of a nearby market of any importance, render the possibility of their exploitation very doubtful.

BUILDING AND MONUMENTAL STONES.

Bishop's Peak Quarry, owned by L. H. Nichols, 1015 Monadnock Building, San Francisco, was formerly operated at two openings on the side of Cerro Obispo, which lies just outside of San Luis Obispo, and was served by a spur track from the narrowgauge railway. No work has been done here for several years. The rock, an andesite granophyre of dark gray color and subconchoidal fracture, has been used extensively for foundations and curbing, and a few buildings in San Luis Obispo, including one of the schools, are built entirely of it.

Bibl.: Bull. 38, p. 153; U. S. G. S. Folio 101.

Caen Quarry, formerly operated in two places, in Sec. 36, T. 32 S., R. 13 E., M. D. M. and in Sec. 26, T. 12 N., R. 35 W., S. B. M., has been idle for years. The material here is a yellow, calcareous cemented, volcanic tuff, which possesses considerable strength and is easily cut to shape for building stone. It was quarried in large blocks which were sawed up into desired sizes and hauled to the railroad two miles away. The quarry was last operated about ten years ago and the tuff was used a little for buildings in Arroyo Grande, San Luis Obispo, and Los Angeles. The greatest faults of the tuff are its porosity and the ease with which it stains. The photograph above shows this material in the arches and windows of the public library.

Bibl.: Bull. 38, p. 159; U. S. G. S. Folio 101.

Lee Quarry, in Sec. 17, T. 30 S., R. 12 E., on the north side of Cerro Romaulda, furnished a large tonnage of rock similar to the material from Bishop's Peak, but has been idle for 25 years.

Bibl.: Bull. 38, p. 160; R. XIII, p. 623; U. S. G. S. Folio 101.

Moore Quarry, in Sec. 31, T. 12 N., R. 35 W., S. B. M., owned by P. Moore of Arroyo Grande was worked by the same company which operated the Caen Quarry, and furnished the same kind of material, though perhaps of better quality. The property has been idle for

years and the equipment has been removed. The deposit is not far from Los Berros, on the Pacific Coast Railway.

Bibl.: Bull. 38, p. 160; U. S. G. S. Folio 101.

Morro Rock, which is an island at the entrance of Morro Bay and is the farthest northwest of the buttes which form a line from below San Luis Obispo to the ocean, is composed of a granophyre which has been used a good deal at Port Harford for breakwater construction. The quarry is on a government reservation and is now idle.

Bibl.: Bull. 38, p. 161; U. S. G. S. Folio 101.



Free Public Library, San Luis Obispo. Local building materials were used in its construction.

H. J. Griffith does a small business cutting stone at San Luis Obispo. For the bases of all of his monuments, where the stone does not require polishing, he uses the andesite granophyre from Bishop's Peak. His equipment includes a gasoline engine and air hammer drill.

Sunset Monument and Building Works, M. P. Rolita, proprietor, San Luis Obispo. The owner and occasionally an extra man are employed in making monuments, curbing, coping, and house foundations. The rock from Bishop's Peak is used for all unpolished require polishing, he uses the andesite granophyre from Bishop's

work and is rather well liked for curbing, especially on account of the way it fractures. Hand tools are used. The rock is of two shades and degrees of hardness, because of the difference in weathering.

On the ranch of **Dan Tomasini**, 7 miles from Morro, there is an extensive deposit of a rhyolitic rock of light brown color, which shows to advantage when rough dressed. M. P. Rolita is using a little of it for monument work, but it is too remote from transportation for active exploitation.

Walter Ranch, Chas. Walter, owner, 8 miles from Morro. A deposit of a fine-grained, light-colored rock occurs which contains a little hornblende and biotite and approaches a granite in appearance and composition. It takes a fair polish and would be valuable if better situated. M. P. Rolita is using some of this stone experimentally in his monument work.

Part of the Salinas River cañon is cut through **granite**, and this deep-seated rock is uncovered over a large area in the eastern and northeastern part of the county; but is too remotely situated to be of any economic value at present.

Sandstone of good quality for building construction occurs at several places in the county but has never been utilized except for making railroad culverts. The best material is found between Cambria and Cayucos on the coast and close to deep water transportation.

CRUSHED ROCK, SAND AND GRAVEL.

Dougherty Quarry is owned by A. A. Dougherty of San Luis Obispo and is 3 miles south of that city, in Sec. 9, T. 31 S., R. 12 E. Development was initiated in September, 1914, by Otto Wannack. The holdings comprise 15 acres. The rock is chiefly Franciscan sandstone, which crops in a steep wall, permitting easy quarrying. Holes 15' to 22' deep are put down by hand and the face blasted off by dynamite. The big blocks are broken to one-man size. Before tramping to the crusher the material is sorted into two grades: the blue, well-cemented sandstone and a softer, brownish rock, which comes from the top and is not as clean as the blue.

The stone is reduced to about 3" size and is stored partly in a 500-ton bin and partly over trestles in big piles in the open. Power is furnished by gasoline engines at a cost of 2¢ per h.p.-hour. There are 7 engines, including one of 80 h.p. and one of 50 h.p. Other equipment includes one 7½" x 3" gyratory crusher, 24 cars, 500-ton bin, and buildings for office, boarding-house, and sleeping quarters. A spur track from the Pacific Coast Narrow Gauge Railroad furnishes transportation. The capacity of the plant is 300 tons per day. Past

production has been at the rate of about 50,000 tons per annum. A crew of 75 men are employed at wages ranging from 25¢ per hour up. There is little overburden and, considering the small investment in plant, the cost of production per ton is not extremely high.

The bulk of rock sold has been for use on the state highway system. The hard, blue material is excellent for concrete and is used for the central roadbed; the brown sandstone is used for shoulder-work and for macadam, where the duty is not so heavy.

I. C. Hodson of Santa Barbara sells to the California Highway Commission a small tonnage of sand for concrete work. The material comes from the Santa Maria River, two miles from the town of the same name and near the railroad. Hand shoveled into the cars, and only a few men employed.

Pacific Coast Coal Company, San Luis Obispo, sells sand for concrete work both from the Santa Maria River and Avila Beach. The sand is taken from the river during the dry season, being shovelled by hand into cars. At Avila Beach a narrow strip along the shore near tide-water is worked in the same way, both places being adjacent to the Pacific Coast Railway tracks. About 12 men are employed a part of the time. During 1915 over 20,000 tons of this sand was used in state highway construction and proved very good for concrete.

Santa Maria Rock Company, now defunct, operated a small rock crushing plant on Nipomo Creek, which supplied a few thousand tons of material for highway construction early in 1915.

On the **Frank Tate Ranch**, 2 miles northeast of San Luis Obispo, a small rock crushing plant, equipped with a gyratory crusher, was put up early in 1915. The rock was an extremely hard and tough basic intrusive which fractured in long splintery pieces. The man who was operating the plant found it so costly to reduce the material that he was forced to abandon work after selling a few thousand tons, although the Highway Commission was paying \$1.00 per ton and he was getting the material on a very low royalty basis.

Templeton Sand Plant, operated by the California State Highway Commission at Templeton, occupies about 15 acres on the Salinas River at the edge of the town.

The plant was built in February, 1915, and supplies sand for highway work for several hundred miles along the coast route.

A drag-line scraper, of 24 cubic feet capacity, takes the sand from the river bed and delivers it to the top of the plant, where it goes through a chute to a trommel. The latter screens it, rejecting everything over $\frac{3}{8}$ ". At the trommel the sand is washed to remove the small amount of clay and to facilitate handling. From the trommel

the coarse goes to the dump, being kept for use later as gravel, and the fine goes down a chute directly to the railroad cars on the spur track built to the plant. Storage at the plant is not required nor provided for. The sand is a clean angular material, mostly quartz, and ranges up to $\frac{1}{4}$ " in size, without much coarser stuff.

A 50 h.p. boiler fired by crude oil furnishes power for the 32 h.p. hoist which operates the drag-line scraper. The trommel is 7' long and is operated by a 5 h.p. motor. Water for washing the sand and



Templeton sand plant. Operated by the California Highway Commission.

for other purposes is pumped from the river 300' away by an American centrifugal pump, operated by a $7\frac{1}{2}$ h.p. induction motor. Small tanks provide storage for fuel oil and water. The boiler requires from 150 to 175 gallons of crude oil per day, depending on weather conditions. Three men are employed at \$2.50 to \$3.50 per diem. A maximum capacity of 385 tons per day is possible.

The sand is furnished by the commission to the contractors at 20¢ per ton and gravel at 25¢, which figures, they claim, represent the cost of production. The total output from February to December, 1915, was about 25,000 tons.

SANTA BARBARA COUNTY.

By EMILE HUGUENIN, Field Assistant.

Field Work in November, 1915.

INTRODUCTION.

Santa Barbara County, created February 18, 1850, is one of the original twenty-seven counties of the state and takes its name from the mission that was founded upon its shores in 1786.

This county consists of 2740 square miles including the islands of Santa Cruz and Santa Rose, which lie 20 miles off the coast forming a natural breakwater 70 miles long. It is bounded on the north by San Luis Obispo County, on the east by Ventura County, and on the south and west by the ocean; having a coast line of about 100 miles.

The population, according to the census of 1910, was 27,738 and is now estimated at over 30,000 as there has been a rapid increase in the last few years. Its assessed valuation in 1915 was \$35,062,648.

The city of Santa Barbara, the county seat with a population of approximately 18,000, lies on the shores of the channel. Due to the equable climate and beautiful surroundings it almost doubles in population during the winter months as people from many parts of the United States winter there.

TOPOGRAPHY.

Santa Barbara County is traversed by two main mountain ranges, the more prominent of which is the San Rafael Mountains. This complex range is divided into two groups by the Sisquoc River and is the continuation of the Coast Range Mountains. It has a structural trend of N. 50° W., and its peaks vary in elevation from 3000' to 7000'; Big Pine Mountain 6828', San Rafael Mountain 6581', Strawberry Peak 6548', and McKinley Mountain 6228', being the most prominent ones.

The Santa Ynez Range, bordering the channel, rises directly from the sea to elevations which vary from 1000' in the west to over 4000' in the east where it joins the San Rafael Mountains. These two divergent ranges form a triangular hilly basin which opens out toward the coast. The Santa Ynez Range is more regular than the San Rafael Mountains and its topography reflects the structure even more than does that of the greater range.

The Casmalia, Solomon, and Purisima Hills, of much less importance than the two main ranges, are distinct structural and topographic units rising from the broad plain between the foothills of the San Rafael Mountains and the Santa Ynez Range and having the same general trend as the bordering ranges.

The principal valleys are the Santa Maria, Los Alamos, Lompoc, Santa Ynez and Cuyama valleys. The Santa Maria Valley is a broad flood plain extending from the San Rafael Mountains on the north to the Solomon Hills on the south and opening out to the sea on the west. The general direction of the valley is north of west. The Los Alamos Valley lies between the low rounded Solomon Hills on the north and the higher more abrupt Purisima Hills on the south, running almost due west. The Lompoc Valley is an alluvial flat several miles wide extending westward from the Purisima Hills to the sea. The Santa Ynez Valley is a long narrow valley ranging in width from a few hundred feet to over a mile, running westward and opening out into the Lompoc Valley. The Cuyama Valley covers a large area in the northeastern portion of the county. It is a wide structural valley extending into San Luis Obispo County on the north, and bounded on the south by the Cuyama Mountains.

STREAMS.

The two principal drainage systems of the county are the Santa Maria, or Cuyama River, and the Santa Ynez River. The former is the natural boundary between Santa Barbara and San Luis Obispo counties. It rises in the high mountains in the northwestern part of Ventura County and flows, in general, westward, draining the Cuyama and Santa Maria valleys.

The Santa Ynez River, which rises in the mountains north of Santa Barbara, flows westward between the Santa Ynez and San Rafael mountains, entering the sea at Surf. Both of these streams carry very little water and run dry during the summer.

The Los Alamos Creek, next in importance, flows westward, draining the Los Alamos and San Antonio valleys.

WATER SUPPLY.

The City of Santa Barbara has driven a 5' x 6' tunnel, 19,560' long, through the Santa Ynez Range. The south portal of this tunnel is in the Mission Cañon, 4 miles north of Santa Barbara, at an elevation of 1186'. The north portal is in the Santa Ynez Cañon, 1216' in elevation. Work was commenced at both ends of the tunnel in April, 1904, and it was completed July, 1913. This tunnel forms a drainage for the water held in storage in the mountain, and the flow encountered here was for several years sufficient to supply the city, which consumes 2,000,000 gallons daily. This storage water has gradually been decreasing, and it will be necessary to supplement it by diverting water from the river through the tunnel.

SANTA BARBARA COUNTY—Table of Mineral Production.

Year	Petroleum		Natural gas		Asphalt-bituminous rock		Mineral water		Industrial earth		Brick		Limestone and lime		Sandstone		Stone industry, value	Unapporportioned and miscellaneous	
	Barrels	Value	M cubic feet	Value	Tons	Value	Gallons	Value	Tons	Value	M	Value	Tons	Value	Cubic feet	Value		Amount and kind	Value
1881																		Gold	12.00
1882																			
1883																			
1884																			
1885																		Gold	2.50
1886																		Gold	2.50
1887																		Gold	5.00
1888																			
1889																			
1890																			
1891																			
1892																			
1893																			
1894																			
1895	1,800	\$1,800				\$91,000													
1896	16,304	12,407				125,000				\$2,600									
1897	30,702	25,211				217,000				31,500					2,000	\$500		12 1/2 flasks quicksilver	
1898																			
1899	130,536	130,536			\$248	18,947	318,000	65,000		30,000									
1900	132,227	132,227				15,700	3,100	15,000		100									
1901	208,220	101,228			120	6,078	124,100	15,000		5,000									
1902	183,176	105,138	1,200	2,064	5,220	105,200	19,000	10,700		10,700					210,000	117,000	\$82,000		
1903	265,016	119,281			63	4,116	55,800	11,700		60,200					72,000	27,100	\$10,000		
1904	200,410	181,115	567	375	1,220	12,700	16,500	60,200	2	2,172					12,000	10,000			
1905	202,520	110,610	520	320	2,074	41,000	88,000	22,500	22,000	15,000					10,000	20,000			
1906	200,000	115,500	3,000	1,500	10,000	100,000	118,000	18,200	6,900	112,200					12,000	10,000			
1907	2,700,000	1,113,000			2,000	30,000	114,200	21,000	3,000	15,000					20,000	10,000		32 flasks quicksilver	
1908	4,870,000	1,274,000	1,000	500	25,000	250,000	11,700	10,450	2,000	13,000					10,000	10,000			
1909	8,092,023	1,100,000	600	300	10,102	238,510	30,400	21,200	2,531	20,000					10,000	10,000		flasks quicksilver	2,000
1910	8,917,580	1,420,700	718,012	337,800	7,000	20,000	5,500	4,082	2,000	2,000					10,000	10,000			
1911	8,116,708	1,000,000	700,000	310,121	200	2,188	151,000	27,000		10,000					10,000	10,000			
1912	7,682,715	1,000,000	9,100,000	1,000,000			10,000	10,000		10,000					10,000	10,000			
1913	6,902,719	1,000,000			233,623	11,320	5,500	105,000	11,300	1,120	13,073				10,000	10,000			
1914	6,291,026	1,101,725	500,000	251,815	10,000	10,000	112,500	10,100	6,895	20,000					10,000	10,000			
1915	4,225,747	1,000,000	6,312,500	378,800	25,000	50,000	100,000	12,000							10,000	10,000			
Totals	73,535,814	\$9,210,477		\$0,419,910	213,000	\$2,430,611	1,718,000	978,552	31,000	\$100,010	34,100	\$289,920		\$0,183,000	757,700	\$899,892	\$279,000		

*Compared with miscellaneous minerals.
Barrels of lime.

TOTALS

Gold	60,000
Petroleum	30,212,477
Natural gas	1,000,000
Asphalt and bituminous rock	2,430,611
Mineral water	100,000
Industrial earth	200,000
Brick	280,000
Limestone and lime	210,000
Sandstone	200,000
Stone industry	279,000
Miscellaneous and unapportioned	170,000

Totals \$12,700,000

It is proposed to construct a dam 150' high, about 1000' east of and above the north portal of the tunnel, in the Santa Ynez River. A concrete foundation 10' in height, and a diverting tunnel 982' long from the dam to the main tunnel, have already been constructed. It is estimated that the completed dam will form a reservoir of sufficient capacity to supply the city over a period of 2 years, exclusive of rainfall.

In the Santa Maria Valley are a number of artesian wells. Guadalupe is supplied principally with water from these wells. Montecito, a suburb of Santa Barbara, derives its water supply from wells sunk close to the coast.

CLIMATE.

The climate of Santa Barbara County is equable throughout the year, excessive heat and cold being very rare. The western coast region is subject to heavy fogs and strong ocean winds. The southern coast is more sheltered, and fogs occur rarely. The rainfall varies from rather light in the valleys to 30 inches on the coast, being confined to the winter and spring months.

TRANSPORTATION.

The county is traversed by the Southern Pacific railroad which follows the coast line, with branch lines from Guadalupe to Betteravia and from Surf to Lompoc. The Pacific Coast Railroad, a narrowgauge line, runs from Port Hartford in San Luis Obispo County, through Santa Maria to Los Olivos, with branches from Santa Maria to Betteravia and Sisquoc. This company also operates an electric line from Guadalupe to Santa Maria, which connects Santa Maria with the S. P. R. R. Several auto stage lines make the interior towns easily accessible to the railroad and to the larger cities.

MINERAL RESOURCES.

As will be seen by referring to the Table of Mineral Production, by far the most important mineral yielded is petroleum. The total value of the petroleum produced up to December 31, 1915, amounts to over 80% of the total mineral production of the county. The actual output of minerals is in excess of that shown by the table. Los Prietos Mines are known to have produced quicksilver as early as 1874, though no record of the production has been kept. Gypsum, which does not appear listed in the table, was shipped from the Pt. Sal Mine for several years previous to 1880. Many prospectors have worked the auriferous sands along the beaches from Pt. Arguello to Pt. Sal, of which no records were kept.

The total recorded production of the county up to the end of 1915 is \$42,740,545. The products in order of their value are: petroleum,

natural gas, asphalt and bituminous rock, mineral water, sandstone, limestone and lime, infusorial earth, brick, stone industry and gold. Quicksilver, platinum and silver are combined under the head of miscellaneous and unapportioned. In addition are known occurrences of barytes, chromite, copper, gypsum and manganese.

ASPHALT and BITUMINOUS ROCK.

These have been grouped under one heading as they were used for the same purposes, both in refining to obtain pure asphalt and for use as road material. There are many deposits of asphalt and bituminous rock in the county, only one of which is worked. All of the asphalt produced is that derived as a by-product in refining crude oil, as it was found impossible to produce asphalt of as pure and even a grade from the crude material as that produced at oil refineries.



Bituminous sands at Higgins Mine, Carpinteria. Photo by A. Sattler.

Harris Mine, formerly worked by the Pacific Asphalt Company, is located $4\frac{1}{2}$ miles north of Harris Station on the Los Alamos Grant. No work has been done on this deposit for 10 years. Property is under lease to the Pinal Dome Oil Company.

Bibl.: R. XIII, p. 39; R. of Minerals of Santa Barbara County;
U. S. G. S. 22d Annual Rep., Part I, p. 428.

Higgins Mine, Mrs. Mary Higgins, owner, is 1 mile southeast of Carpinteria station, between the railroad and the sea. Beds of bituminous sands varying in width from 12' to 20' lie flat in a shallow V-shaped trough of underlying shales that opens westward toward the sea. This is a continuation of the deposit known as Los Conchas Mine, formerly worked by the Alcatraz Asphalt Company, and is the only deposit at present worked in the county.

The sands are covered with a soft soil overburden 4' thick and are easily worked. The overburden is stripped off, used for filling, and the bituminous sands dug out with hot spades. This material is said to contain from 18% to 20% bitumen.



Mining bituminous sands at Higgins Mine for paving Goleta Road. Photo by A. Sattler.

The crude material is heated in revolving cylinders called "torpedoes," and mixed with sand and crushed rock in the following proportions: 2 parts crude material, 2 parts crushed rock, 1 part sand. The charge is heated to 375°, ten minutes time being required to effect a thorough mixture. The rock used is crushed to 1". Each "torpedo" handles 1½ yards per charge. A spur track of the S. P. R. R. runs into the property.

Over 20,000 tons of this material have been used on the roads in Santa Barbara County in the past few years. The Goleta and Carpinteria roads are fit examples of the excellency of this material for road



Mining with hot spades at Higgins Mine. Photo by A. Sattler.



Plant for treating bituminous sands at the Higgins Mine. Photo by A. Sattler.

use, as they were laid down with only a 4" covering over a dirt base, several years ago and are yet in excellent condition.

Worked by A. Sattler and E. P. Stevens of Carpinteria, lessees.

Kaiser Asphalt Mine, formerly operated by the Consolidated Asphalt Company, has been idle for many years and the company was disorganized. The property is now owned partly by the New Pennsylvania Oil Company, and partly by the Rice Ranch Oil Company.

Large bed-like deposits of asphalt varying from 20' to 70' thick, capped with sandstone, occur in the Graciosa Hills. These deposits were mined by shaft and tunnels, and the material treated at a small refinery erected at the mine. It was never a commercial success.

Bibl.: R. XIII, p. 38; R. of Minerals of Santa Barbara County;
U. S. G. S. 22d Annual Report, Part I, pp, 427, 428.



Well drilled in bituminous shales at Carpinteria. Filled with liquid asphalt.

Las Conchas Mine, owned by W. H. Crocker et al., San Francisco, adjoins the Higgins Mine on the west (see above). It was the first deposit of asphalt worked in the county. Upper State street, Santa Barbara, was paved with the material 30 years ago and is still in good condition. A refinery was erected by the Alcatraz Asphalt Company and the deposit worked many years. Practically exhausted. Idle.

Bibl.: R. XIII, p. 38; R. of Minerals of Santa Barbara County,
Bull. 11, p. 51; U. S. G. S. 22d Annual Report, Part I, p. 444.

La Patera Mine is on the Den Ranch, 2 miles southwest of Goleta. This deposit of bituminous rock was mined by the Alcatraz Asphalt Company, and the material treated at the company's refinery at Carpinteria. Exhausted in 1898. Yielded 60% bitumen.

Bibl.: R. XII, p. 30; XIII, p. 39; R. of Minerals of Santa Barbara County; U. S. G. S. 22d Annual Report, Part I, p. 442.

More Asphalt Mine, owner, J. F. More of Goleta, is situated 2 miles south of Goleta along the coast at More's Landing. A deposit of bunch-like veins of bituminous rocks, exposed along the beach by the banks caving away. These veins are very irregular, and of great width and unknown depth. The deposit was worked for many years by quarrying but is now idle, with no prospect of resuming. The first asphalt used for street work in San Francisco was that shipped from here over thirty years ago.

Bibl.: R. XIII, p. 39; R. of Minerals of Santa Barbara County, 1906. U. S. G. S. 22d Annual Report, Part I, p. 441.

Santa Maria Asphalt Company's Mine, 10 miles southeast of Santa Maria, is the property of the Rice Ranch Oil Company. Asphaltum and bituminous rock outcrop over many acres. Worked by open cuts and tunnels many years ago. Company disorganized. Idle.

Bibl.: Rep. XII, p. 32; XIII, p. 39.

Sisquoc Mine, situated on the Sisquoc Rancho, 20 miles southeast of Santa Maria, was worked by the Alcatraz Asphalt Company over 20 years ago. Large lens-like deposits of bituminous sands, averaging 200' thick, cover an area of approximately 6 square miles. It has been estimated that this area contains over 50,000,000 cu. yds. of the bituminous sands. A large refinery was constructed for treating the sands but was not a success. Plant removed and mine abandoned. Owned by Sisquoc Rancho Company.

Bibl.: R. XIII, p. 42; R. of Minerals Santa Barbara County.

BARYTES.

Eagle Mine, owners P. D. Jesse et al., Santa Maria, is in Secs. 5 and 6, T. 10 N., R. 30 W., S. B. M. A vein of pure white barytes, averaging 20' or more in width, is exposed for several hundred feet along the top of ridge above the North Fork of La Brea Creek, at an elevation of 2800'. The vein occurs in a tough gray sandstone, strike E. and W., with the trend of the ridge, and dips steeply to the north. Samples of the barytes are said to have analyzed 97% BaSO₄. Deposit reached by 20 miles of trail and road to Sisquoc, the nearest point of transportation.

Bibl.: R. of M. S. B. Co., 1906.

BRICK.

Grant Brick and Tile Company, P. Grant and E. P. Stevens, owners. Brick yard at west end of Montecito St., Santa Barbara. No production for past two years. Idle.

Bibl.: Bull. 38, p. 257.

Milpas Street Brick Yard, Santa Barbara, W. T. Coleman, owner. A clay bank 5' to 10' high is quarried by pick and shovel and the clay hauled in 1800 lb. car up incline track 100' to a machine press. The bricks are air-dried and burned in open kilns. Crude oil is used. Plant equipped to handle 30M to 40M bricks daily. Work 5 months during the year, employing 16 men.

Bibl.: Bull. 38, p. 257.

CHROMITE.

Deposits of chromite occur in the hills southwest of Pt. Sal and in the San Rafael Mountains, south of Santa Ynez. As these occurrences are small and inaccessible they have never been developed.

COPPER.

Croppings of copper ore occur along the south slope of the San Rafael Mountains northeast of Los Olivos. The ore is azurite and chalcopyrite associated with quartz in mineralized shales. The croppings may be traced for four miles striking east and west with the trend of the range. Several claims (listed below) have been taken along these croppings and a little development work done, but there has been no production. This region is rather inaccessible being 12 miles or more from Los Olivos, the nearest railroad station.

Copper King Mine, owned by P. B. Montanaro, Los Olivos, consists of 2 unpatented claims in Sec. 5, T. 7 N., R. 29 W., S. B. M. An 1100' tunnel was driven in to cut a quartz ledge containing chalcopyrite. This mine is very inaccessible, being located near top of ridge. Worked for assessment only.

Bibl.: R. of M. S. B. County, 1906.

Laguna Ranch Mine, owned by the Laguna Ranch Company, has been leased by P. B. Montanaro, Los Olivos. This deposit is on the Laguna Ranch, 3 miles directly west of the Copper King claims. The ore at the surface is azurite and malachite, associated with quartz in a zone of mineralized shales 40' wide. The strike of the vein is E.-W., and dips about 45° N. The development consists of 2 tunnels, each 40' long. Worked for assessment only.

DIATOMACEOUS EARTH (See Infusorial).

GOLD.

Gold and platinum occur in the black sands that are deposited more or less continuously along the beaches from Pt. Arguello north to the mouth of the Santa Maria River. The most important deposits are at Surf, and north of Pt. Sal. These sands were worked by washing over amalgam plates many years ago and some gold and platinum produced. Several different types of machines were tried for the profitable extraction of the precious metals none of which thus far have been successful.

The black sands lie in strata of from $\frac{1}{2}$ " to 2" thick and are covered by layers of gray beach sands up to several feet thick. During heavy storms the lighter beach sands are at times washed away and the black sands exposed.

Bibl.: R. VIII, p. 537; X, p. 598.

Albernathy Mine, on the beach north of Pt. Sal, was worked many years ago by washing the black sands over plates. The gold occurs in minute flakes and it was found impossible to extract at a profit. Abandoned.

Bibl.: R. XIII, p. 348; R. of M. Santa Barbara Co., 1906.

Anna Moore Mine (quartz). Located on the San Lucas Ranch in the Santa Ynez Mountains, 30 miles northwest of Santa Barbara. Development consists of a short tunnel driven on a vein that showed traces of gold. Abandoned.

Bibl.: R. XIII, p. 348.

Bear Creek Placer Mine is along the beach extending from the mouth of Bear Creek to Surf. L. Leonard is sampling the beach sands to determine the extent and value of the auriferous sands. He is to put into operation a machine of special design for the extraction of the precious metals. It is said that the black sands at this place vary in value from \$2 to \$40 per cu. yard.

GYPSUM.

Pt. Sal Mine; owners, the Casmalia Rancho Lands Co., E. Marshall, 111 West Fourth St., Los Angeles, president. The mine is situated $\frac{1}{2}$ mile southeast of Pt. Sal Landing, in a rugged cañon. The deposit is an irregular vein of pure white gypsum grading into alabaster. The vein occurs in clay. The gypsum was mined through several tunnels in the early 80's. The workings are all caved and it is impossible to approximate the extent of the vein.

The gypsum was hauled to Pt. Sal Landing and lowered by cable to

ships moored outside of the rocks. Shut down over 20 years ago, as it could not compete with the gypsum mines on the Mexican coast.

Bibl.: R. VIII, p. 538; R. of M. Santa Barbara Co., 1906; Bulletin 38, p. 288.

Santa Barbara Cañon. An extensive undeveloped deposit of pure gypsum and alabaster is exposed along the east side of the Santa Barbara Cañon, 5 miles south of Quartel P. O. in the Cuyama Valley. Various claims have been taken on this deposit at different periods but they have all been abandoned as the gypsum is very inaccessible, being over 50 miles to the nearest railroad.

Bibl.: Bull. 38, p. 288.

INFUSORIAL EARTH.

The deposits of infusorial earth in the vicinity of Lompoc are said to be the purest found in the state. There are many extensive deposits in this vicinity; the only ones at present being worked are those east of San Miguelito Cañon in the foothills of the Santa Ynez Range. These deposits have been thoroughly described by Ralph Arnold and Robert Anderson in the U. S. G. S. Bulletin 315 "Diatomaceous Deposits of Northern Santa Barbara County." Other deposits are exposed in the low hills south of Surf, and along the coast south of Goleta; however, they are not as pure as the deposits in the vicinity of Lompoc.

James Guerra has a large undeveloped deposit of flaky, white diatomaceous shales on the Santa Rita Ranch, 5 miles east of Lompoc, on the north bank of the Santa Ynez River. Formerly owned by the Bank of Lompoc.

Bibl.: Bulletin 38, p. 295.

Kieselguhr Company of America, home office 11 Broadway, New York. A. H. Krieger, general manager. This company has taken over the Ballam Brothers Mine and the Dimock Mine, 2 miles southeast of Lompoc, and are at present the only producers of infusorial earth in the county. Extensive beds of soft, white earth in a very pure state, varying from thinly bedded to massive, form a capping over the hills, overlaying hard brown siliceous shales, conformable with them, striking E.-W. and dipping 30° S.

This material is being quarried by open cuts. It is taken up in large blocks and air dried at the quarry, taking from 40 to 50 days to reduce the water content to 5%. It is then hauled by motor trucks to the plant at Lompoc where it is ground to powder and transferred to the different warehouses by a pneumatic system. When blocks are required the material is transported in its natural state direct

from the quarry, sawed into the required sizes and dried before shipment. Waste material, too fine to be dried, is utilized in making brick, tile, and other refractory materials.

The quarry is worked only during the dry months, employing over 100 men.

Bibl.: Bulletin 38, pp. 293-296. For full detail of the Kieselguhr Industry see "Metallurgical and Chemical Engineering, Vol. XII, No. 2, p. 109.

More Ranch, J. F. More, owner. Beds of infusorial earth are exposed along the coast at More's Landing, 2 miles south of Goleta, striking N. 25° E. and dipping 45° to 50° NW. This material is not as pure nor as extensive as that of the Lompoc deposits and has never been developed.

F. N. Rudolph, of Lompoc, has a large undeveloped deposit of infusorial earth one mile southeast of Lompoc, adjoining the Kieselguhr property on the east.

Salsipuedes Ranch Deposit, owned by the Hollister Estate Company, 35 West Carrillo St., Santa Barbara. An undeveloped deposit of pure white infusorial earth, from thin bedded to massive, occurs on the Salsipuedes Ranch, 3 miles southeast of Lompoc. This deposit is over 100' thick and very extensive, capping the low hills south of the Santa Ynez River. The owners are now preparing to develop it.

Bibl.: Bull. 38, p. 296.

Silica Products Company has a deposit of infusorial earth on Tract No. 79 of Lompoc Rancho, $\frac{3}{4}$ mile south of La Salle, a station on the Lompoc branch of the S. P. R. R. This deposit overlays beds of hard silicified shales. A plant for grinding and brick making was erected and considerable development and experimental work done. No production. The plant was partially destroyed by a cloudburst in February, 1915. Idle. E. J. Mitchell, president, Stockton, California.

Sykes Ranch, lots 155 and 158 of the Lompoc Rancho. Richard Sykes, Montecito, owner. Beds of infusorial earth cap a low rounded hill $\frac{1}{2}$ mile east of the S. P. R. R. near Honda Station. These beds are quite extensive, striking east and west and dipping flatly to the north. Deposit composed of flaky white material, fairly uniform in character. Diatomaceous shales are exposed for a few hundred feet along the coast east of this deposit and are probably a continuation of the same beds, but are not as pure at this place. Undeveloped.

Sunnyside Mine, Jessie Telford, owner, is 2 miles southeast of Lompoc in a side cañon of San Miguelito Creek. Some development work done here many years ago, but now idle.

Bibl.: Bull. 38, p. 296, R. of M. S. B. Co., 1906.

LIMESTONE.

J. C. Lind of Lompoc owns a deposit of limestone on the south side of San Miguelito Cañon, six miles southwest of Lompoc, opposite that on the property of the Union Sugar Company. The deposit was sampled and the limestone analyzed by the Union Sugar Company. Found to contain a high percentage of magnesium which prohibits its use for the refining of sugar. Undeveloped.

Bibl.: R. of M. S. B. Co., Bull. 38, p. 80.

Thomas W. Moore, Santa Barbara, has an undeveloped deposit of limestone in Veronica Valley, 3 miles west of Santa Barbara. This limestone is coarsely crystalline and of a yellowish color. The owner



Limestone Quarry of the Union Sugar Co., southwest of Lompoc.

has had numerous tests made on it and reports that it is of no commercial value. It is said, however, that the cement used in the construction of the Mission Santa Barbara was made from this limestone.

Bibl.: Bull. 38, p. 80; R. of M. S. B. Co.

Moraga Ranch Deposit. A deposit of a fine grained white limestone, almost pure calcium carbonate, outcrops along a side hill, of the upper Mono Cañon, in Sec. 4, T. 6 N., R. 20 W., S. B. M. Some development work was done here several years ago by the Lomo Blanco Lithographic Stone Company of Los Angeles. The limestone was found to be cut by numerous small siliceous veins which made it unfit for lithographic work. Company disorganized and property abandoned.

Bibl.: R. of M. Santa Barbara Co., 1906; Bull. 38, p. 80.

Union Sugar Company, Betteravia, operates a limestone quarry 6 miles southwest of Lompoc on the north side of San Miguelito Cañon, at an elevation of 1150'. The limestone occurs in a massive ledge varying in width from 15' to 35'. The formations here are broken and distorted and the limestone outcrops in 5 distinct deposits over the 40 acres owned by the company. The deposits grade from a siliceous limestone conglomerate to a pure white fossiliferous limestone. It overlies blue shales. Three of the deposits are now



Face of limestone quarry, showing limestone conglomerate at left and contact with blue shale at right.

being quarried, two having already been exhausted. Twelve men are employed. The stone is broken by hand to cobble size, and hauled in 1800 lb cars to bins, from which the stone is dumped into wagons, 10 ton capacity, and hauled to Lompoc. Forty tons are daily hauled to Lompoc by 2 teams. Produce approximately 6,000 tons yearly, working 8 months. Over 90,000 tons have been shipped from the quarry to the sugar factory at Betteravia, where it is made

into quicklime. Operated continuously since 1900. It is estimated that the remaining supply of limestone will be exhausted within the next 5 years.

Bibl.: Bull. 38, p. 81; R. of M. S. B. Co., 1906.

MANGANESE.

Manganese occurs in the San Rafael Mountains, 10 miles in an air line, east of Los Olivos. The manganese is said to outcrop over an area of several acres along the top of a high ridge. This deposit is very inaccessible and has never been developed.

MINERAL SPRINGS.

The mineral springs of Santa Barbara County are confined mostly to the southern slopes of the Santa Ynez Range and its foothills. The value of mineral water produced in 1915 was more than double the value of that produced in any other county. Practically all of the water produced was marketed for medicinal purposes, having a great value in the alleviation and eradication of many chronic diseases. There should be a great increase in this production, as the medicinal springs become better known and developed. They compare favorably with some of the best curative waters of Europe.

Burton Mound Sulphur Springs. Numerous small sulphuretted springs, visible at low tide, issue from the sands along the beach at Santa Barbara. A large sulphur spring, over which the Hotel Potter is built, was formerly utilized by pumping its waters to a drinking fountain in the lobby. Due to the objectionable odor the pipe was sealed and no use is made of the spring.

Bibl.: R. XIII, p. 517; U. S. G. S. Water Supply Paper 338, p. 277.

Bythenia Springs. Owner, J. M. McNulty, Santa Barbara. Situated on the Hope Ranch, $3\frac{1}{2}$ miles west of Santa Barbara and $\frac{1}{2}$ mile northwest of Veronica Springs. The water rights are leased to the Santa Barbara Mineral Water Company, 1933 Howard St., San Francisco. The company ships the water in barrels to San Francisco, where it is bottled and marketed for medicinal purposes. For analysis of Bythenia water see page 150.

Bibl.: U. S. G. S. Water Supply Paper 338, p. 295.

Las Cruces Hot Springs, on the Las Cruces Ranch, north of Gaviota. A group of 4 warm sulphuretted springs flowing about 50 gallons per minute issues from a clay bank on a hillside. The water is piped to the ranch houses for local use. Not utilized commercially. The Hollister Estate Co., Santa Barbara, owner.

Bibl.: R. XIII, p. 345; U. S. G. S. Water Supply Paper 338, p. 68.

Montecito Hot Springs. A group of 11 mildly sulphuretted hot springs, ranging in temperature from 110° to 120° with a total flow of approximately 50 gallons per minute. These springs issue from seams in thick bedded sandstone on the steep south slopes of Santa Ynez Mountains, 6 miles northeast of Santa Barbara. Elevation at springs, 1500'. A resort was formerly conducted on this property but it is now owned by a private club of Montecito residents who use it as a summer camp. Some of the water is piped to the houses of the club members at Montecito.

Bibl.: R. XII, p. 345; U. S. G. S. Water Supply Paper 338, p. 66.

Moore Spring, the property of Thomas W. Moore, Santa Barbara, is in the Veronica Valley, 3 miles west of Santa Barbara and opposite the Veronica Medicinal Springs. A large spring flows out of soft clay below a limestone ledge. (See Limestone—T. W. Moore, deposit.)

This spring has not as yet been developed, but Mr. Moore expects to market the water shortly. For analysis see page 150. Like the Bythenia and Veronica mineral waters it belongs to the purgative class of water, being characterized by its high content of magnesium sulphate (Epsom salts).

Pinkham's Santa Barbara Mineral Springs are 2½ miles west of Santa Barbara on the Hope Ranch, overlooking Veronica Valley. A group of 5 mineral springs seep from soft clay near top of low mesa. The largest of the group is housed in a concrete tank from which it is syphoned down to two 50,000 gal. wooden tanks and a small bottling plant. Bottle approximately 1,500 gals. yearly. S. C. and R. F. Pinkham, owners, 1135 State St., Santa Barbara. For analysis see page 150.

Bibl.: R. of M. S. B. Co., 1906; U. S. G. S. Water Supply Paper 338, pp. 295–296.

San Marcos Cold Springs, owned by the Miramar Hotel Company, and situated 20 miles northwest of Santa Barbara near the San Marcos Pass at an elevation of 1100 ft. One large flowing cold spring, slightly mineralized, issues from thick bedded sandstone. The water rights are leased to the Cold Springs Water Company of Santa Barbara, who are marketing the water at Santa Barbara for table uses.

Analysis of this water—Prof. J. A. Dodge, Analyst. (Constituents are in grains per U. S. gallon.)

Silica	0.35
Sodium chloride	1.54
Sodium carbonate	1.92
Calcium carbonate	3.02
Magnesian carbonate	0.67
Calcium sulphate	5.74
Potash and lithium.....	Trace
	<hr/>
	13.24

A group of warm sulphuretted springs are located about a mile west of this cold spring, but the water is not utilized.

Bibl.: U. S. G. S. Water Supply Paper 338, p. 67.



Veronica Valley. Location of Veronica, Bythenia, and Moore mineral springs.

Veronica Springs, Veronica Medicinal Springs Water Company, Santa Barbara, owner; F. H. Kimball, president. A group of 5 mineral springs situated on the west side of Veronica Valley, 3 miles west of Santa Barbara and $\frac{1}{2}$ mile north of the ocean.

These are commercially the most important springs of the county, as the waters have been marketed for 20 years with an increasing demand. The water is an alkali saline water of purgative qualities and of unusual strength, which makes it of great medicinal value (see analysis, page 150). The main spring is located 180' in elevation above the floor of the valley and is housed in a bottomless concrete tank. The water is piped to 9 storage tanks, total capacity

of which is 500,000 gals., syphoned into a 50-barrel tank-wagon and hauled to the bottling plant at Santa Barbara. It is here sterilized by boiling and then bottled. The plant is bottling 1,200 gallons daily, employing 10 men. Two men employed at the springs.

The company is to erect in the near future a hotel and cottages at these springs to be conducted as a health resort.

Bibl.: Bull. 38, p. 294; U. S. G. S. Water Supply Paper 338, pp. 294-295, 296.

Analyses of Medicinal Springs of Santa Barbara County.
Constituents are in grains per U. S. gallon.

	1 Bythenia	2 Moore	3 Pinkham	4 Veronica
Potassium sulphate	2.72		38.55	
Sodium carbonate	7.27		8.65	
Magnesium sulphate	1,146.70	968.25	50.40	1,192.70
Calcium sulphate	111.28	62.86	32.64	69.43
Iron and alumina	1.46	.35	2.02	.26
Sodium sulphate	333.10	172.56	662.34	344.51
Sodium chloride	194.47	242.02	45.42	233.66
Magnesian nitrate	278.01			407.63
Magnesian carbonate	35.45		90.03	
Silica	1.64	4.26	.87	1.81
Sodium nitrate		70.79		
Organic and volatile		234.90		
Lithium chloride .....			.23	
Magnesian chloride			35.40	53.99
Calcium chloride			108.03	
Calcium phosphate			1.97	
Calcium carbonate			1.61	145.72
Potassium carbonate				15.71
Totals	2,112.10	1,755.99	1,149.38	2,495.45

1. Analyst—E. W. Hilgard; authority, advertising matter.
2. Analyst—Pacific Wasserman Laboratories; authority, Thomas W. Moore.
3. Analyst—J. M. Curtis & Sons; authority, advertising matter.
4. Analyst—U. S. Bureau of Chemistry; authority, P. H. Kimball.

NATURAL GAS.

The production of natural gas in Santa Barbara County ranks second to petroleum. Sufficient natural gas is produced in the Santa Maria Field for the operation of a number of casing-head gasoline plants and also to supply consumers in Santa Maria, Betteravia and Guadaloupe. (See Santa Maria Gas and Power Co., below).

In 1914, over 55% of the production of casing-head gasoline in California was credited to the 8 plants in the Santa Maria Field, where this industry is the most active. For that year the average yield in gasoline per thousand cubic feet of gas used, was 1.35 gallons. The quantity produced was 4,225,334 gallons valued at \$323,701.¹

¹Mineral Resources of the United States, 1914, Pt. II, pp. 804-805.

Thus it will be seen that of the total recorded value of natural gas produced, over 85% was for the value of gasoline produced from this gas.

The following plants are in operation in Santa Barbara County: American Gasoline Company, 1 plant; Pinal Dome Oil Company, 2 plants; Purity Gasoline Company, 1 plant; Rice Ranch Oil Co., 1 plant; Union Oil Company, 2 plants; Western Gasoline Company, 1 plant.

A complete description of the methods employed in the manufacture of casing-head gasoline is contained in Bulletin No. 88 of the U. S. Bureau of Mines, "The Condensation of Gasoline from Natural Gas."

The total quantity of gas produced in the oil fields is not known; many of the companies are using the gas for light and power at the fields and the flow is not measured. For further detail see Bull. 69, pp. 113-115.

Cone's Wells, Summerland. Two $2\frac{1}{2}$ " wells, 125' deep, drilled in 1893, a few hundred feet north of the railroad track yielded sufficient gas to provide light and fuel for 20 families. The flow gradually diminished and stopped entirely several years ago.

Bibl.: R. X, p. 601; R. XIII, p. 569; Bull. 11, p. 56.

Darling Brothers Wells, Summerland. Two 2" wells, 150' deep, $\frac{1}{4}$ mile north of the beach. First well drilled in 1891, second in 1895. Free flow of gas up to 1911, when it became necessary to pump. Now supplying 24 families at Summerland.

Bibl.: R. X, p. 601; XIII, p. 569; Bull. 11, p. 56; U. S. G. S. Bull. 321, pp. 39, 50.

Santa Maria Gas and Power Company, R. E. Eaton, manager, is supplied with natural gas from the Pinal Dome Oil Company, Union Oil Company, and the Brookshire Oil Company. It is distributing from 35 to 40 million cu. ft. per month to consumers in the towns of Santa Maria, Betteravia and Guadaloupe. They expect to greatly increase the output on obtaining a franchise to supply consumers in San Luis Obispo County.

PETROLEUM.

Santa Barbara County ranks fourth in the production of petroleum in this state, having produced in 1915 a total of 5,634,534 bbls., valued at \$3,442,700. The three oil producing districts of the county, Santa Maria, Lompoc and Summerland fields, were recently described by R. P. McLaughlin and C. A. Waring in Bulletin 69, "The Petroleum Industry of California," so that no further description will be entered here. A list of references follows.

Bibl.: R. VII, p. 89; XII, p. 537; XIII, p. 582; R. of M. S. B. Co., 1906; Bulls. 11, 19, 32, 63, 69.

PLATINUM.

Platinum occurs with gold in the black sands that are deposited along the beaches at Surf and north of Pt. Sal. Some platinum was produced from these deposits years ago. (See Gold.)

QUICKSILVER.

Quicksilver was discovered in Santa Barbara County at the Los Prietos Mines in 1860. Seven years later cinnabar was found in the Acachuma Cañon in the San Rafael Mountains. At both of these localities it has been mined intermittently for many years. No records of the production previous to 1880 are available. The unusual increase in the price of this metal during the latter part of 1915 has stimulated interest in the old mines and this year (1916) will undoubtedly show increased activity in the development of these properties.

Acachuma Mine. Formerly worked by the Red Rock Quicksilver Mining Company, is in Sec. 2, T. 7 N., R. 29 W., S. B. M., 12 miles east of Los Olivos at the head of the Acachuma Creek. The development consists of several tunnels totaling 2000 ft. The ore body is mineralized serpentine and shales striking N. 40° W. and dipping 50° E. Said to average 30 ft. in width. The ore was treated in a 12-pipe retort, 2 miles below the mine, on Acachuma Creek. A good wagon road runs from Los Olivos to the retort. This mine has been worked mostly by tributers. Idle. C. Woods, Santa Ynez, owner.

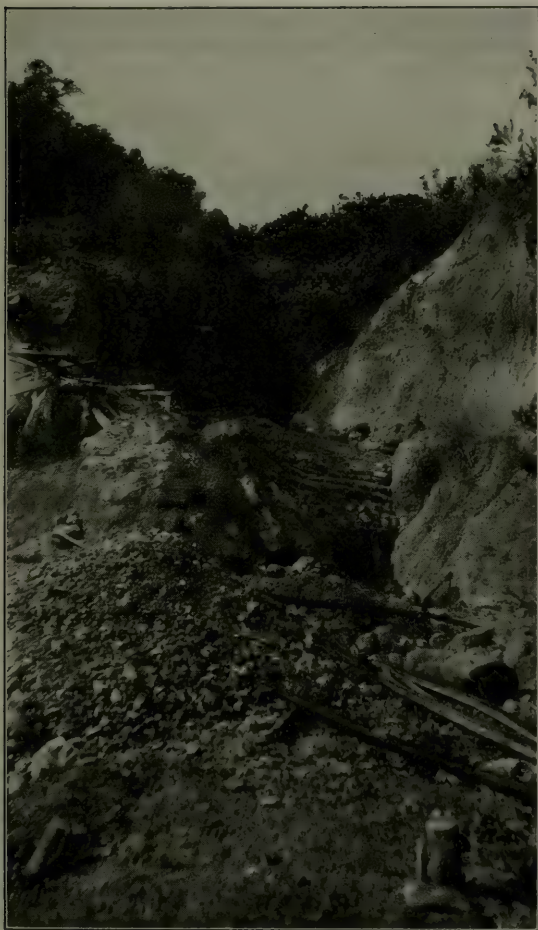
Bibl.: R. of M. S. B. Co., 1906; Bull. 27, p. 196.

Los Prietos Mines are 8 miles in an air line directly north of Santa Barbara, in that portion of the Santa Ynez Mountains north of the river. This group of mines is located on a belt of mineralized serpentine, that extends along the range for several miles. Strike N. 50° W., dip southward. The width of the ore body varies from 40' to 200' and it is a well defined ledge. The ore, cinnabar, is disseminated through the ledge matter, and is in general low grade, averaging about 0.5%. Occasionally rich pockets or shoots are encountered in which the ore will run up to 13%. This deposit was discovered in 1860 by José Moraga, but was not worked to any extent until 1874, when the price of quicksilver rose to \$126 per flask of 75 lbs. A large furnace (now in ruins) was erected on the Santa Ynez River below the mine, and over 200 men were employed. Operations ceased in 1876 due to a decline in the price of quicksilver and prolonged litigation over the title to the property. Reopened in 1877 but has never since been worked on a large production basis. The property is somewhat inaccessible and can only be approached by trail over the Santa

Ynez Mountains 13 miles from Santa Barbara or by wagon road, 40 miles.

The Nejalyegua y Los Prietos Land Grant was purchased in recent years by the United States government, and several locations on the old workings have been filed.

Bibl.: R. VIII, p. 537; X, p. 596; XII, p. 366. Bull. 27, p. 196;
U. S. G. S. Monograph XIII, p. 382.



Upper workings at Snow Group (Los Prietos Quicksilver Mine),
Santa Barbara County.

Millborn-McAvoy Mercury Mine, formerly part of Los Prietos Mines, is situated in Sec. 12, T. 5 N., R. 27 W., S. B. M., two miles east of the north portal of the Santa Barbara Water Tunnel. Development consists of 3 tunnels and several open cuts. The greatest vertical depth below outcrop is 600 ft. No equipment. Ruins of an old furnace below the tunnels. Idle. Worked for assessment only. The 2 claims were located in 1908 by present owners, C. L. Millborn and J. M. McAvoy, 434 East Thirtieth St., Los Angeles.

Carl H. Snow et al., of Summerland, California, have a group of 10 claims at the old Los Prietos workings, in Secs. 9, 10, 11, T. 5 N., R. 27 W., S. B. M. The mining of late years has been confined to the claims near the top of the range north of the river. Development consists of several tunnels and a shaft. Impossible to determine amount of work as the old workings are caved. A 10-pipe retort was erected on a flat a few hundred feet below the mine, to which ore was hauled by team. Old road to mine from river. Worked for assessment only. Reported to have been recently taken over by E. S. Rigdon of San Luis Obispo, Calif.

Santa Rosa Quicksilver Mine, owners. D. D. Davis and C. R. Clark, Los Olivos, is 12 miles northeast of Los Olivos in Sec. 3, T. 7 N., R. 29 W., S. B. M. Adjoins the Acachuma Mine and is a continuation of the same deposit. Two men working, driving tunnel to cut ore body. The ore will be treated at the Acachuma retort.

Steward Quicksilver Mine adjoins the Acachuma Mine. Some development work done here over 10 years ago, but no quicksilver was produced. Abandoned.

Bibl.: R. of M. Santa Barbara Co., 1906.

SANDSTONE.

"The high ridge of the Santa Ynez Mountains from Point Concepcion eastward is formed by a great monocline of sandstone of supposed Vaqueros age that dips toward the sea on the south at an angle of 25°."² On the range back of Santa Barbara this sandstone is very massive and dips to the north. Huge boulders of this sandstone in the Mission and Refugio cañons have been quarried for many years.

The increasing use of concrete in the county has almost entirely displaced the sandstone industry, so that very little building stone is now quarried.

Erickson Quarry in T. 9 N., R. 34 W., S. B. M., J. B. Arellanes of Santa Maria, owner. Beds of a tough gray sandstone are exposed in a

²Ralph Arnold and Robert Anderson, U. S. G. S. Bull. 317, p. 14.

railroad cut near Casmalia Station. Some of this rock was used for masonry work on the railroad years ago. Idle.

Bibl.: R. XIII, p. 637; R. of M. Santa Barbara Co., 1906; Bull. 69, p. 133.

Hogan Quarry, in Sec. 2, T. 4 N., R. 27 W., S. B. M., is 3 miles north of Santa Barbara in the Sycamore Cañon. T. M. Hogan, 826 Orange Ave., owner. Beds of hard gray sandstone, a couple of hundred feet thick outcrop in Sycamore Cañon for several hundred feet. Stone from this quarry was used in building the breakwater at Santa Barbara; also in the portals of the Bay-Shore cut-off tunnels at San Francisco, and the Sespe, Piru, and Santa Clara railroad bridges in Ventura County. Idle for past five years.

Bibl.: R. of M. Santa Barbara Co., 1906.

Mission Cañon, 2 miles north of Santa Barbara. Large boulders of a hard, fine-grained buff-colored sandstone are occasionally quarried by hand, by the Franciscan monks, for building purposes, about the Santa Barbara Mission.

Bibl.: Bull. 38, p. 133.

Orella Estate Quarry, in Sec. 12, T. 5 N., R. 31 W., S. B. M. A quarry of sandstone boulders at the head of Refugio Cañon on the Santa Ynez Range, 8 miles north of Orella station on the S. P. R. R. The boulders are quarried by Geo. Robson of the Santa Barbara Monumental Works. Three carloads of this stone recently shipped to Los Angeles, was the only production recorded during the past five years. Idle.

Bibl.: Bull. 38, p. 133.

STONE INDUSTRY.

Under this heading are grouped crushed rock, sand and gravel.

C. A. Reed, superintendent of streets at Lompoc, employs a few men to quarry chert beds in a side cañon of San Miguelito Creek, $2\frac{1}{2}$ miles southwest of Lompoc, for use in the streets at Lompoc. A force of men is also engaged hauling gravel from China Creek, near Lompoc, for use on the roads. An average of 30 men are employed for this city street and road work.

Santa Barbara Unit Brick and Tile Company, 10 State St., Santa Barbara, use some gravel and clay in the manufacture of artificial stone and tile. Ten men employed at plant. This company is the successor to The Miracle Pressed Stone Company.

Southern California Acclimatizing Association, R. Riedel, 315 State St., Santa Barbara, manager, operates a quarry in Sec. 1, T. 4 N., R. 27 W., S. B. M., 6 miles northeast of Santa Barbara. Beds of a

hard, cemented red conglomerate, containing a high percentage of quartz pebbles, are exposed for 700 ft. along the Mountain Drive back of Montecito.

This material is quarried by churn drilling the full depths of the face (50 ft.) and blasting with Giant powder. The plant for crushing and sizing the rock consists of a jaw-type crusher—capacity 20 yds. per hour, revolving screen sizing the rock into 5 classes, and bucket elevator. It is operated by a small gasoline engine. From 12 to 20 men are employed. The stone is mostly used for road material and is said to be very fine for that purpose.

VENTURA COUNTY.

By EMILE HUGUENIN, Field Assistant.

Field Work in December, 1915.

INTRODUCTION.

Ventura County, created March 22, 1872, is one of the coast counties and lies between parallels 34° and $34^{\circ} 50'$ north latitude, having a coast line of about 50 miles. It is bounded on the north by Kern County, on the east by Los Angeles County, on the south by Los Angeles County and the Pacific Ocean, and on the west by Santa Barbara County. The total area is 1878 square miles. The population as shown by the census of 1910 was 18,347 and is now estimated at over 22,000. Its assessed valuation in 1915 was \$32,159,977.

The city of Ventura, originally called San Buenaventura, is the county seat and lies on the shores of the Santa Barbara Channel. It has a population of approximately 4000. The cities of Oxnard and Santa Paula, next in importance, are of almost equal population. Fillmore has grown from a town of a few hundred to over 1000 in the past five years, due to the activity in the oil fields of that vicinity.

Ventura County is essentially an agricultural county. The increasing production of petroleum in the past few years is rapidly bringing it forward on the list of mineral producing counties.

TOPOGRAPHY.

The northern portion of this county is characterized by the convergence of several important mountain ranges which make of it a high and rugged region. Its lofty peaks range in elevation from 6000' to 9000', the most prominent of which are Mt. Pinos, elevation 8826'; Mt. Frazer, 8026'; Pine Mt., 7488'; and Alamo Mt., 7371'. To the northwest extend the San Emigdio Mountains, which form the connection between the Coast Range and the Sierra Nevada Mountains. To the west extend the San Rafael Mountains, while farther southward, the Santa Ynez Mountains diverge from this group, running westward through Santa Barbara County. The southern part of the county is characterized by a series of parallel folds, the axes of which lie east and west, forming low mountain ranges of no great continuity.

The principal valleys are the Santa Clara, Ojai, Simi, and Las Posas.

The Santa Clara is a flat river wash, the level floor of which ranges in width from a mile at Piru to over 5 miles at Saticoy, where it opens out into the wide Oxnard terrace. It is bounded on the north by Sulphur Mountain, and the more rugged mountains to the east, that form the divide between it and the San Joaquin Valley. On the

south it is bounded by the Santa Susana Mountains, Oak Ridge and South Mountains.

The Ojai Valley, north of the Santa Clara Valley, and separated from it by Sulphur Mountain, is an intermontane depression which evidently had its origin in a system of profound faults.¹ The trend of the valley is east and west. A low ridge across its length divides this depression into two parts, called Upper Ojai Valley and Lower Ojai Valley. The lower valley is drained by the San Antonio Creek which flows westward into the Ventura River, while the Upper Valley is drained by Sisar Creek flowing eastward into the Santa Paula Creek, a tributary of the Santa Clara River.

The Simi Valley lies between the Oak Ridge Mountains on the north and the Simi Hills on the south. The Las Posas Valley is a continuation of the same drainage basin and westward joins the Santa Clara Valley, where it opens into the wide marine terrace.

STREAMS.

The two principal drainage systems of the county are the Santa Clara River and the Ventura River. Next in importance, but subordinate to these is the Caleguas Creek, which drains the Simi and Las Posas Valleys.

The Santa Clara River rises in Los Angeles County and flows westward 75 miles, emptying into the sea south of the city of Ventura. Its principal tributaries from east to west are the Castac, Piru, Sespe, and Santa Paula Creeks, all of which flow from the north. This stream runs almost dry in summer but in the winter is subjected to floods, often doing great damage in the valley.

The Ventura River receives its principal water supply from the Matilija Creek, which rises on the southern slopes of Pine Mountain and flows southward, entering the sea at the city of Ventura. This river carries sufficient water throughout the year for irrigation purposes and to supply the city of Ventura.

CLIMATE.

The climate in the southern portion of the county is delightful throughout the year, the summer heat being tempered by cool ocean breezes. Farther east in the valleys it becomes very hot during the dry season. The mountainous region in the northern portion of the county receives a coating of snow in the winter. The rainfall is confined to the winter and spring months.

¹George H. Eldridge, The Santa Clara Valley Oil District, U. S. G. S. Bull. 309, p. 3.

VENTURA COUNTY—Table of Mineral Production.

Year	Gold value	Petroleum		Natural gas		Asphalt and bituminous rock		Brick		Clay		Sandstone		Stone industry value	Unapportioned and miscellaneous	
		Barrels	Value	M cu. ft.	Value	Tons	Value	M	Value	Tons	Value	Cu. ft.	Value		Amount and kind	Value
1880	\$351															
1881	000															
1882																
1883																
1884																
1885																
1886																
1887																
1888																
1889	2,858															
1891	1,715															
1892																
1893																
1894	290,913	\$367,822				248	\$1,800									
1895	244,024	244,024				175	3,500					16,200	\$16,500			
1896	248,000	272,800										33,200	20,900			
1897	368,392	368,392														
1898	27,500	573,000				1,050	86,775	256	\$2,228							
1899	456,200	826,200				5,188	169,740	376	35,000							
1900	2,562	143,000	368,700			1,660	31,670	220	1,700			12,500	6,250	\$35,270		
1901	4,183	472,037	236,028			2,673	38,945					4,300	2,650	16,764	3,000 tons borax... Silver	60,000 4
1902	2,012	475,000	435,000			37	370					3,200	1,600	22,500	50 tons mica ... 3,500 tons borax ...	2,700 100,000
1903	1,087	542,502	547,031			1,114	13,368	1,780	12,000			1,700	900	25,100	50 tons mica ... 50 tons mica ...	3,800 8,000
1904	2,709	618,000	965,082	1,800	\$2,700	3,069	34,968									
1905	1,200	735,522	236,578	3,731	5,000	3,000	30,000	1,200	10,000	30	\$45	2,300	1,350	31,267		
1906	*	311,000	155,500	3,650	1,000	2,700	37,000	1,675	11,000			1,320	792	66,400		
1907	3,223	241,331	18,777	2,578				1,000	12,000							
1908	289,025	377,919	3,727	4,731				500	7,000	260	1,680					
1909	24,412	23,572	3,724	2,124				1,275	7,825							
1910	62,147	319,808	545	681				1,100	26,042							
1911	499,982	2,977,777		2,958				300	5,400	1,000	1,900	4,658	2,325	750		
1912	662,300	381,811		4,703				500	3,575	1,000	1,900	4,600	1,850			
1913	569,007	967,007	62,200	6,230				1,603	6,815	3,000	2,700	300	350		Unapportioned	1,530
1914	943,963	591,125	100,000	0.000				165	3,162			1,105	702			
1915	1,017,229	569,723	191,870	39,076				200	2,500					2,674	Other minerals	210
Totals.	\$22,871	10,712,453	\$9,181,858	\$67,332	\$1,275	\$374,216	12,645	\$121,170	6.90	\$7,815	92,312	\$38,549	\$40,200			\$1,048,887

*Unapportioned.

TOTALS.

Gold	\$22,871
Petroleum	2,661,783
Natural gas	67,332
Asphalt and bituminous rock	374,216
Brick	121,170
Clay	7,815
Sandstone	58,849
Stone industry	410,200
Unapportioned—miscellaneous	1,048,887

Totals to end of 1915.

\$11,672,339

TRANSPORTATION.

The county is traversed by the S. P. R. R., with a branch line from Ventura to Nordhoff. At Montalvo, five miles east of Ventura, the main line divides into two branches, one going to Los Angeles via Las Posas and Simi Valleys, the other through the Santa Clara Valley, joining the San Joaquin Valley line at Saugus. The northern portion of the county is extremely inaccessible, only a few trails penetrating this mountainous region from the south. Access to the gold and borax districts is obtained over the new State Highway from Bakersfield to Los Angeles via the Tejon Pass. A fine line of automobile stages over this highway now makes those districts easily accessible.

MINERAL RESOURCES.

Ventura County was the 21st county in the State in respect to the value of its mineral production for 1915 (Bulletin 71, Mineral Production for 1915).

By referring to the Table of Mineral Production for Ventura County it will be seen that the value of petroleum produced was over 99% of the total value of minerals produced that year; natural gas, brick, and sandstone together making up the remainder.

The total recorded production of the county up to the end of 1915 is \$11,572,339; its products, in order of their values, being, petroleum, \$9,461,583; unapportioned and miscellaneous, which include borax and mica, \$1,048,387; stone industry, \$410,296; asphalt and bituminous rock, \$374,216; brick, \$121,170; natural gas, \$67,352; sandstone, \$58,849; gold, \$22,871; and clay, \$7,615.

The actual output of minerals has been greatly in excess of that shown by this table. The production of borax from the time of its discovery in this county in 1898 up to 1907 amounted to over 35,000 tons, valued at over \$1,000,000.² The greater part of this production has been recorded in the general tables of mineral production of the State, over this period, under the heading "Unapportioned." This was for the purpose of concealing the identity of single mines operating in a county. Considerable gold was produced previous to 1880. See "Gold."

In addition to the above minerals are known occurrences of gypsum, infusorial earth, limestone, mineral water, mineral paint, and phosphates.

²U. S. G. S. Bull. 540, p. 434.

ASPHALT and BITUMINOUS ROCK.

The manufacture of asphalt by refining from crude petroleum has entirely replaced its production from the natural asphalt and bituminous rock deposits, and no work has been done on the various deposits in the last decade.

Brea Cañon Mine, W. R. H. Welden, Ventura, owner, is on the Canada Larga ranch 5 miles north of Ventura. Narrow veins of bituminous rock, which open out into pockets or kidneys, are irregularly distributed over an area of 200 acres. This rock is said to contain 40% asphaltum. Mined by tunnel. Discovered in 1887 and worked from 1890 to 1893, taking out almost 1000 tons which were sold at \$10 per ton. Inability to compete with the asphaltum produced from crude petroleum in the refineries caused the cessation of operations.

Bibl.: R. XIII, p. 44; Bull. 11, p. 48.

Cañon Del Diablo Mine, is 5 miles northwest of Ventura on the Cañada de San Miguelito Ranch. This deposit of bituminous rock was worked for 7 or 8 years by the Ventura Asphalt Company, and was practically exhausted 10 years ago. The Taylor Estate, Ventura County, owner.

A detailed report on this mine is given by Prof. E. W. Hilgard in the 10th Annual Report of the State Mineralogist.

Bibl.: R. X, p. 763; XIII, p. 44.

Ojai Mine is in Secs. 3 and 10, T. 4 N., R. 22 W., S. B. M., 3 miles west of Nordhoff in the Upper Ojai Valley. Deposit of decomposed sandstone and shales impregnated with a heavy viscous bitumen which is seeping out from bituminous shales. Undeveloped. J. S. Briggs and F. W. Ewing, Ventura, owners.

Bibl.: R. XIII, p. 45; U. S. G. S. 22nd Annual Report, Part I, p. 446.

Punta Gorda Mine, $\frac{1}{4}$ mile north of the S. P. R. R. at Punta Gorda, is in Sec. 1, T. 4 N., R. 25 W., S. B. M. Asphaltum occurring in bunch-like and very irregular veins in bituminous shales and clays which strike east and west, dipping steeply to the north. Development consists of 140' tunnel and 100' shaft at face of tunnel. Worked by Punta Gorda Asphalt Mining and Paving Co. in 1895. Company disorganized and mine abandoned. Property of Henry D. Abbott and Thomas Gaynor, of Punta Gorda.

Bibl.: R. XII, p. 33; XIII, p. 45; U. S. G. S. 22nd Annual Report, Part I, pp. 445-446.

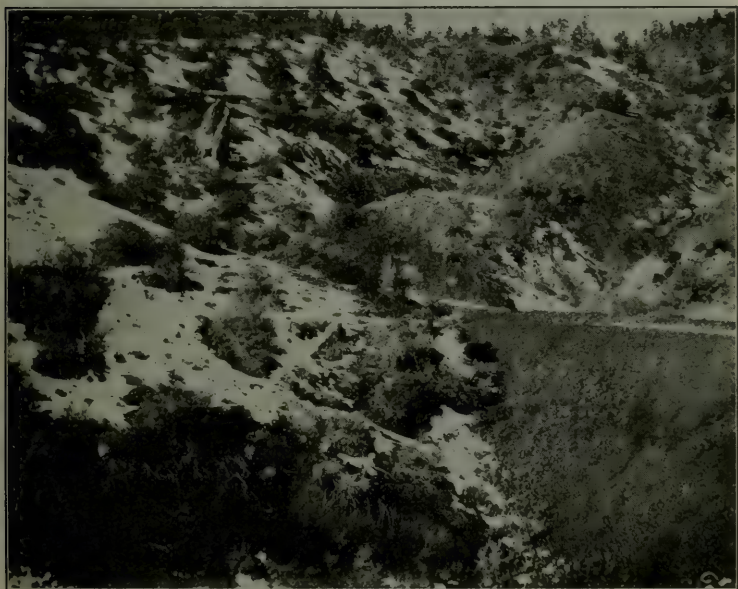
Rincon Mine. A deposit of bituminous sands $1\frac{1}{2}$ miles northeast of Punta Gorda. Development consists of a small tunnel and open

cut. Deposit was found to be too limited in extent for profitable extraction and was never worked.

Bibl.: R. XII, p. 33; R. XIII, p. 45.

BORAX.

Colemanite, a borate of lime, was first found in Ventura County, in 1898. The deposits are confined to a narrow belt along the eastern slopes of Mt. Pinos, in the extreme northeast corner of the county, and are classed among the few important borax deposits of the United States. However, they are about 60 miles from the nearest railroad, and can only be worked at a profit under the best conditions.



Outcrop of colemanite-bearing beds, at Stauffer, Ventura County. Photo by F. W. Sperry.

The colemanite deposits occur within a series of bedded rock formations that have been extensively folded and faulted. In general, the trend of their outcrop is northeast and southwest and the beds dip southeastward.

The colemanite ore has not been found to any extent in outcrops on the surface. Quoting Mr. Hoyt S. Gale, of the U. S. Geological Survey, who made a detailed study of these deposits, "The chief characteristic of the outcrops seems to be the occurrence of gypsum,

in stringer form, mainly interlaminated in the bedding of the fissile and crumpled shales, as a rule closely associated with beds of basaltic lava and in the principal ore bodies, with ledges of massive travertine-like limestone."

For further detail on the geology of these deposits see U. S. G. S. Bulletin 540, p. 436 and Prof. Paper 85a.

A number of claims have been taken along this belt, but only 3 mines have developed.



Gypsiferous shales containing colemanite, Stauffer, Ventura County. Photo by F. W. Sperry.

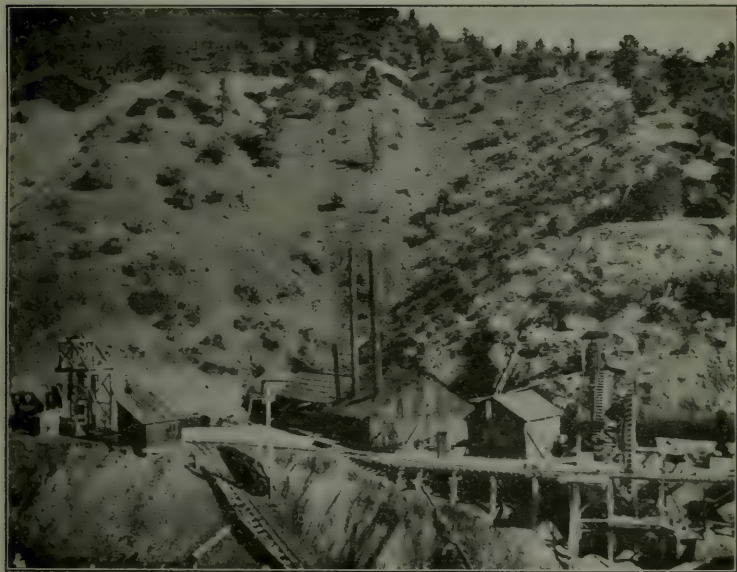
Columbus Mine, formerly owned by the Calm Brothers, of Los Angeles, consists of one patented claim (160 acres) and 10 unpatented claims. It is the northeasternmost of the 3 mines of this district. The ore body is worked through a 400-foot, 3-compartment shaft, and a 100' main tunnel. The underground workings are said to be very extensive but were inaccessible at the time of my visit, as the mine was flooded.

Located in 1899, and operated continuously from 1902 to 1907. Sold in 1912 to the National Borax Company. They erected an extensive plant, including a rotary roaster 6' x 60', jaw-type crusher, screens, etc. Crude oil was used for fuel, and it was planned to construct a pipe line 16 miles to Lebec for transporting the oil.

Shut down in 1913 and has been idle since. Sold to the United States Borate Co., of West Virginia, C. B. Zabriskie, president.

Bibl.: U. S. G. S. Bull. 540, p. 448.

Frazier Mine was the first property located in the district for borax. It is the southwesternmost of the 3 mines, lying between Seymour and Bitter Creeks. It consists of 20 patented claims. The main workings are confined to Sec. 14, T. 8 N., R. 21 W., S. B. M. The ore body is worked by a number of tunnels, the main one being



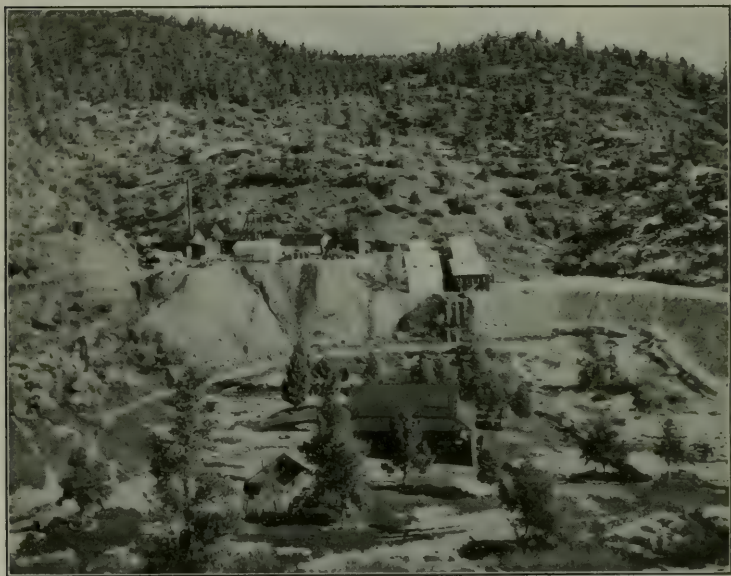
Columbus Mine, at Stauffer. Rotary roaster at extreme right of photo.
Photo by F. W. Sperry.

1700' long. These are driven along the course of the vein. The ore bodies are lenticular, often averaging 14' in width. The ore is essentially massive colemanite and is shipped from the mine without treatment. It is said that over 25,000 tons of colemanite were produced up to the time the mine was shut down in 1907. Stirling Borax Company of Los Angeles, owners. Idle.

Bibl.: U. S. G. S. Bull. 540, p. 443.

Russell Mine lies between the Columbus and Frazier Mines, in Seymour Cañon, and consists of 200 acres. Owned by The Russell Borate Mining Company, 624 California St., San Francisco. The workings consist of a main shaft, 200' deep, with levels at 50', 100'

and 200'. The 200' level is the main working level. It is 450' long, running N. 16° W., and strikes the ore body at 319'. From this point a drift is run along the ore, whose strike is N. 75°-80° W. and dip 60° S. At 368' from shaft another drift was driven, exposing an ore body on 3 sides for 50' on each side. A 50' winze was sunk from the 200' level. The old stopes are caved and it is impossible to determine their extent.



Russell Borate Mine, at Stauffer, Ventura County. Photo by F. W. Sperry.

The ore body consists of glassy crystalline colemanite, varying from white to black in color and mostly massive. It is closely associated with limestone.

A borax drying furnace, of 25 tons per 24 hours capacity, was partially constructed in 1913, but never completed. The mine was shut down that year, due to a decline in the price of borax, and has not been reopened. It is dewatered daily, pumping about 30,000 gallons from the 200' level. Two men employed. Fred W. Sperry, Stauffer, superintendent.

Bibl.: U. S. G. S. Bull. 540, p. 445.

BRICK and TILE.

Peoples Lumber Company, Ventura, is the only producer of brick and tile operating in the county. The clay used is plowed down from a hill on the northern border of the city and hauled $\frac{1}{2}$ mile in a large side dump wagon to the brick yard. Red drainage tiles of different sizes, and common bricks are pressed by machine and burned in open kilns. Crude oil is used for fuel. Ten men are employed during the season (3 months), making about 250 M bricks and 25 M tiles.

Bibl.: Bull. 38, p. 259.

CEMENT, NATURAL ROCK.

(See Limestone.)

GOLD.

The gold deposits of Ventura County are confined to the high mountainous region in the northeastern portion of the county, embracing Mt. Frazer on the north, and McDonald Peak on the south, and known as the Piru District. The gold occurs in fissure veins in the mountains, which are composed largely of granite, syenite, schist and slate, and in the gravels of the Piru drainage basin.

It is said that the first gold discovered in California was that found in the placers of this district in 1841 by Andres Castillero, who afterwards discovered the New Almaden Quicksilver Mines in Santa Clara County. In 1842 gold was shipped from the placers to the U. S. Mint at Philadelphia.³ The gravels were worked in a crude way for many years and considerable gold was taken out. The mining of late years, however, has been confined to the quartz veins. This region suffers the disadvantage of being over 50 miles from the main lines of transportation and practically inaccessible during the winter and spring months. The new State Highway from Bakersfield to Los Angeles via Tejon Pass makes that district much more accessible and should greatly aid in its development.

Bunker Hill Mine is on the western slope of Frazer Mountain, at an elevation of 6000'. The mine was developed by tunnels and open cuts and has been idle for many years. It is one of a group owned by Fred M. Wilcox et al., 618 Investment Bldg., Los Angeles. See White Mule Mine.

Bibl.: R. XII, p. 314; XIII, p. 497.

Castac Mine, consisting of 3 patented claims, is in Sec. 22, T. 7 N., R. 19 W., S. B. M. Underground workings consist of over 3000'

³See Hittell's History of California, Vol. II, p. 313.

of tunnels and drifts. Five-stamp mill on Piru River below mine; aerial tramway for hauling ore from mine to mill. Sold in 1911 to the Castac Mining Co., its present owners. The company is doing some development work and is to add 5 more stamps to the mill. L. B. Bowker, Santa Paula, president.

Bibl.: R. VIII, p. 683; R. XII, p. 315; R. XIII, p. 497.

Contact Mine, located in 1897 by Thomas and L. Harris of Ventura, is in Secs. 34 and 35, T. 8 N., R. 20 W., S. B. M. Vein strikes N.-S., dips 40° W., varying in width from a few inches to 4', said to average 14". The workings consist of 3 tunnels driven along the vein at different levels and connected by winzes. The greatest vertical depth of the vein exposed below the outcrop is 700'. A 2-stamp mill has been erected on Long Dave Creek, below the mine. Worked only during the dry season by the two brothers.

Fairview Mine adjoins the Bunker Hill and White Mule Mines on Frazer Mountain, and is one of the group owned by Fred M. Wilcox et al. See White Mule Mine.

Bibl.: R. XII, p. 315; R. XIII, p. 497.

Foley Mine, John Foley, Gorman, owner, is on the western slope of Frazer Mountain at an elevation of 7000'. A couple of shallow shafts were sunk over 20 years ago. Idle.

Bibl.: R. VIII, p. 682; R. XIII, p. 497.

Frazer Mine, located in 1867, was the first quartz mine worked in the district. It is on the southern slope of Frazer Mountain, at an elevation of 7000'. The development work consists of 7 tunnels, totalling over 2200'. A 10-stamp mill was erected many years ago, but has fallen into disuse and is badly in need of reconstruction. In 1893 mine was sold to the Frazer Mining Company, of Los Angeles. Operated up to 1895 and has been idle since. Owner, J. E. Bicknell Estate, 304 S. Broadway, Los Angeles.

Bibl.: R. VIII, p. 682; R. XII, p. 315; R. XIII, p. 497.

White Mule Mine is on Frazer Mountain, adjoining the Bunker Hill and Fairview Mines. These 3 mines are owned by Fred M. Wilcox et al., 618 Investment Bldg., Los Angeles, California. Development consists of a vertical shaft 319' deep and drainage tunnel 180'. There is a 5-stamp mill and sawmill for cutting mine timbers on the property. The 3 properties are worked for assessment only. Idle.

Bibl.: R. VIII, p. 682; R. X, p. 316; R. XIII, p. 497.

GYPSUM.

Ojai Gypsum Mine is 3 miles east of Nordhoff on the low divide that separates the two Ojai valleys. Worked in 1890 by the Tacoma Calcium Company, who sunk a 100' shaft and drove over 1000' of drifts. After cutting into the face, the gypsum was found to contain numerous small seams or stringers of black clay. This made hand sorting necessary and the property was abandoned. Caved. Idle.

Bibl.: R. VIII, p. 688; Bull. 38, p. 288; U. S. G. S. Bull. 223, p. 122.

South Mountain Deposit, owner, Joshua Stockton, Santa Paula. Deposit of soft white gypsum, interbedded with diatomaceous shales, 4 miles south of Santa Paula on the south slope of the mountains at an elevation of 2000'. The gypsum is massive but granular in texture, and impure. Undeveloped.

Sunset Plaster and Cement Co., Fillmore, worked a deposit of gypsum in Secs. 12 and 13, T. 3 N., R. 20 W., S. B. M., 4 miles by road south of Fillmore. Bed of massive white gypsum striking E.-W. and dipping flatly to the north, interbedded with diatomaceous shales. Mined by open cut and hauled to Fillmore, where a plant for the manufacture of wall plaster was erected. The gypsum became very impure with depth. After having produced about 10,000 tons the mine was abandoned. Worked from 1911 to 1914. Idle.

INFUSORIAL EARTH.

South Mountain Deposit. Thinly laminated beds of yellowish white diatomaceous earth, striking E.-W., dipping 60° N., outcrop along the south slope of the mountain at an elevation of 2000'. This earth is permeated with a strong odor of petroleum and is rather impure. Hot gases are exuding from between the beds at several places. The temperature of the rocks at the most violent of these exudations is 146° F. and a light coating of sulphate salts is being deposited on them.

Joshua Stockton and Merle J. Rodgers have 10 unpatented claims along the top of this mountain, consisting of 1400 acres. Undeveloped.

LIMESTONE.

The only known limestone deposits in the county of any commercial value are those limestone beds outcropping in the Matilija Cañon. This limestone is said to be a natural rock cement.

"A limestone which in nature contains sufficient clay, or other substance, mixed with the carbonate of lime, so that it only requires

proper burning and grinding to form a cement, is called a water-lime or natural cement rock." (Bulletin No. 38, p. 171.)

Argilla Claims, located in 1904 by E. Duryea, Hollingsworth Bldg., Los Angeles, are in Secs. 23 and 24, T. 5 N., R. 24 W., S. B. M. Massive bed of limestone exposed on south side of cañon, striking east and west, dipping south. This deposit has been frequently sampled and the rock is said to be an excellent natural cement. An analysis of an average sample as given by E. Duryea is as follows:

	Per cent
Silica	16.015
Aluminum and iron oxide.....	5.320
Lime	42.630
Magnesia	1.119
Carbon dioxide	34.190

The deposit is 23 miles north of Ventura and 8 miles northeast of Nordhoff, with a good wagon road running almost to the property. Undeveloped.

Matilija Claims. Joshua Stockton and Merle J. Rodgers, Ventura, owners. Beds of hard, blue limestone are exposed along top of ridge north of the Matilija Cañon, above Stingley's Hot Springs and opposite the claims of E. Duryea. Trail to claims from the Matilija cañon. Inaccessible. Undeveloped.

Ventura Cement Company Deposit. Joseph Roth, Ventura, president. Exposure of limestone beds (natural cement rock) outcropping in a side cañon south of Matilija Creek, one mile above Vickers Hot Springs. The company owns 400 acres, patented, in Secs. 22, 23, 26, and 27, T. 5 N., R. 25 W., S. B. M. Analyses (see below) of this limestone have been made by the U. S. Testing Laboratory at St. Louis and the Riverside Portland Cement Company.

Analyses of Natural Cement Rock.

	Per cent	Per cent
Silica	10.82	8.68
Alumina	4.34	3.20
Magnesia	1.66	1.27
Carbon dioxide	38.47	37.89
Lime	47.13	48.90
Totals	100.42	99.84

Authority Joseph Roth.

Sugar Lime Rock Company, formerly of Oxnard, have moved to Los Angeles. All of the limestone used by the sugar refineries of Ventura County is at present quarried in San Bernardino County.



Outcrop of natural cement rock on property of Ventura Cement Co.,
Matilija Cañon.

MICA.

A deposit of muscovite, exposed along the northeastern slope of Alamo Mountain, in Secs. 12, 13, and 24, T. 7 N., R. 20 W., was developed by the Mount Alamo Mica Company in 1907. A small grinding plant was erected on the Piru River, but as the mica occurred only in small plates the property was abandoned. Total production amounted to less than 200 tons.

Bibl.: Bull. 38, pp. 337, 338.

MINERAL PAINT.

South Mountain Deposit. Joshua Stockton and Merle J. Rodgers, owners. Beds of soft red shales over a thickness of 60' and extending for several hundred feet, are exposed on the south slope of the mountain near the top. The material is of a uniform brick-red color, is easily sawed, and pulverizes readily upon crushing, leaving little or no grit. Undeveloped.



Matilija Cañon, looking northward. Site of Lyons, Stingley's, and Vickers Springs.

MINERAL SPRINGS.

The mineral springs of Ventura County are confined mostly to the Matilija and Sespe cañons, and are of the same general character, ranging from hot to cold, and more or less sulphuretted. No mineral water is shipped out of the county, but the springs have been used for many years for bathing and medicinal purposes. Hotels and baths were erected at some of these springs over 40 years ago. Health resorts are conducted at a few of the larger and more important groups. Many of the springs are not utilized, due to their inaccessibility.

Lyon Springs is situated in the Matilija Cañon, 7 miles northwest or Nordhoff, between the Matilija and Vickers springs (see below). A summer resort was conducted here for many years. A large sulphuretted spring rises in a ravine to the south of the main cañon. The water was piped 1000' to a stone reservoir and then to a boiler to heat for bathing purposes. Property idle for several years. Mrs. G. A. Lyons, Nordhoff, owner.

Bibl.: U. S. G. S. Water Supply Paper 338, p. 278.

Matilija Hot Springs, 6 miles northwest of Nordhoff in Matilija Cañon, $\frac{1}{4}$ mile above its junction with the north fork. Sim Meyers, Ventura, conducts a summer resort at these springs with hotel and cottage accommodations for 200 people.

A group of four warm sulphuretted springs rises from between upturned beds of hard, buff-colored sandstone. The main sulphur spring has a temperature of 116° F. and is piped to a large swimming plunge and tub baths. The three smaller springs are used for drinking purposes.

Analyses of Matilija Hot Springs.

Constituents are in grains per U. S. gallon.

	Mother Eye	Fountain of Life	Hot Sulphur	Lithia
Calcium carbonate	5.66	1.30	.51	.60
Magnesium carbonate	3.66	.11	1.18	1.40
Sodium carbonate	6.56	5.20	-----	5.50
Sodium chloride	3.52	15.00	1.60	.70
Silica	1.00	1.10	1.60	2.10
Calcium sulphate	3.63	-----	-----	-----
Sodium sulphate	2.90	-----	1.00	.90
Total solid matter	10.07	22.71	12.09	11.20
Sulphur gas*	90	30	33	-----

Analyst not known. Authority, advertising material.

*Probably hydrogen sulphide expressed in cubic inches per U. S. gallon.

Bibl.: U. S. G. S. Water Supply Paper 338, pp. 63, 64.

Sespe Hot Springs, situated in Sespe Cañon, 22 miles northwest of Fillmore. A group of hot sulphuretted springs issue from the

bank above the creek. These springs are on Government land and can be reached only by trail. They are not utilized.

Bibl.: R. XIII, p. 524; U. S. G. S. Water Supply Paper 338, p. 66.

Stingley's Hot Springs are in Matilija Cañon $\frac{1}{2}$ mile west of Lyons Springs. A group of warm sulphuretted springs issuing from the bed of the cañon, were formerly used for bathing purposes. The waters of the creek are now flowing over these springs and the property has been abandoned.

Bibl.: U. S. G. S. Water Supply Paper 338, p. 63.

Sulphur Mountain Springs are situated in Sisar Cañon, $\frac{1}{4}$ mile west of its junction with Santa Paula Cañon. A large, cold sulphuretted spring flows from a tunnel on the hillside 150' above the creek. This water is piped to a swimming plunge and baths. A smaller spring issues from the bank on the opposite side of the creek and is used for drinking purposes. A resort established in 1905 is conducted by the Sulphur Mountain Springs Co., A. C. Hardison, Santa Paula, secretary.

Bibl.: R. XIII, p. 524; U. S. G. S. Water Supply Paper 338, p. 279.

Sulphur Spring, northeast of Nordhoff, on property of Chas. Orr, is sometimes called Ojai Sulphur Spring. It is a small sulphuretted spring rising in a pool on the north slope of the Ojai Valley. The country rock is hard white sandstone, of the same character as that exposed in Matilija Cañon 5 miles to the west. The spring is not utilized commercially.

Bibl.: U. S. G. S. Water Supply Paper 338, p. 278.

Vickers Hot Springs. A group of mildly sulphuretted hot springs flowing out from a low bank of crushed shales and gravel at the north edge of the Matilija creek, 9 miles northwest of Nordhoff. A hotel and baths were constructed in 1873 for a health resort. The buildings were washed away by floods in 1884, following which the property was abandoned.

Bibl.: U. S. G. S. Water Supply Paper 338, p. 62.

Wheeler's Cold Spring, is in Sespe Cañon, several miles above the Sespe Hot Springs, and nine miles by trail north of Wheelers Hot Springs. A large flowing cold spring issues out of a clay bank and is utilized for irrigating alfalfa. A small summer camp is conducted here during the fishing and hunting seasons by the Wheeler's Hot Springs Company, Webb W. Wilcox, manager.

Wheeler's Hot Springs. W. C. Blumberg Estate, owner; are $7\frac{1}{2}$ miles northwest of Nordhoff, in the north fork of Matilija Cañon. A group of three warm springs flows out of clay banks on both sides of

the creek. The larger of the three, consisting of about 11 small springs within a radius of a few feet, has a temperature of 100° F. and flows about 35 gallons per minute. This is piped to a swimming tank. The other two springs (Bucket Spring and Genoveva Spring) have temperatures of 62° and 75° respectively, each flowing about $\frac{1}{2}$ gallon per minute. They are used for drinking purposes.

A resort has been conducted here since 1890, open throughout the year, with hotel and cottage accommodations for several hundred people. Electric lights are supplied by a 25-h.p. motor run by a small water-power plant. Webb W. Wilcox, manager.

Analyses of Wheeler's Hot Springs.

Constituents are in grains per U. S. gallon.

	Wheeler's Hot	Bucket	Genoveva
Calcium carbonate	1.01	1.71	16.34
Magnesium carbonate .....	.90	1.38	-----
Sodium carbonate	22.83	21.50	-----
Calcium sulphate	-----	-----	6.80
Magnesium sulphate	-----	-----	5.67
Potassium sulphate .....	.60	.45	.90
Sodium chloride	23.58	23.44	.63
Sodium sulphate .....	.92	1.92	7.85
Iron carbonate	Trace	Trace	Trace
Silica	1.60	1.75	1.60
Totals	51.44	52.15	39.79

Analyses by Wade and Wade, Los Angeles. Authority, advertising matter.

Bibl.: U. S. G. S. Water Supply Paper 338, pp. 64-66.

MOLYBDENITE.

Small kidney-like deposits of molybdenite associated with copper ores are said to occur on Frazer Mountain and on McDonald Peak. As the region was covered with snow at the time of our trip through the county, the deposits were inaccessible.

NATURAL GAS.

The Santa Clara Valley oil fields are producing natural gas which is utilized in part at the wells, and for the manufacture of casing-head gasoline, also to a small extent, for mixing with artificial gas to supply consumers in Ventura, Oxnard and Santa Paula.

The only casing-head gasoline plant in the county is that of the Montebello Oil Company, operating south of Fillmore.⁴

Ventura Power Company has a group of 9 gas wells 3 miles north of Ventura, only 5 of which are now producing. These wells were drilled several years ago and the flow has been gradually diminishing.

⁴For further details see Bull. 69, pp. 113-115; U. S. G. S. MIN. RES., 1914, Pt. II, pp. 804-805.

Now producing from 2 M to 3 M cubic feet per 24 hours. This natural gas is mixed with artificial gas and supplied to consumers in Ventura, Oxnard, and Santa Paula.

PETROLEUM.

The producing oil fields of Ventura County are confined to the Santa Clara Valley and the hills north of the Simi Valley. The best grade of petroleum produced in the state is found in this county. There has been a rapid increase in the production in the last few years due to the extensive development carried on by the Montebello Oil Company in Shields Cañon. The yield for 1915 was 1,017,220 bbls. valued at \$869,723.

As the petroleum industry of this county has recently been described in detail by R. P. McLaughlin and C. A. Waring of the State Mining Bureau, in Bulletin No. 69, "The Petroleum Industry of California," no further description will be entered here.

Bibl.: R. VII, p. 101; R. VIII, p. 684; R. XII, p. 357; R. XIII, p. 585. Bulletins 11, 19, 32, 63 and 69.

PHOSPHATES.

Small deposits of white phosphates in a soft, earthy sandstone, occur along the top of South Mountain, 4 miles south of Santa Paula, on the homestead of **Joshua Stockton**. These phosphates are in thin strata scattered through the soft sandstone which crumbles readily in the hand. The owner reports that samples of this material sent to Los Angeles for analysis contained 5% Calcium Phosphate.

PLATINUM.

An occurrence of lode platinum has been reported recently from near Stauffer, but we have so far been unable to confirm it.

SANDSTONE.

The sandstone industry of the county has greatly decreased in the past few years, and only one quarry remains at which any stone has recently been cut.

For many years building stone was quarried from the huge boulders and broken slabs of the Sespe brownstone in Sespe Cañon. This is a hard brown sandstone, uniform in texture and color and very resistant to weathering as shown by the bold outcropping ledges and the fresh surfaces of the broken slabs.

Massive beds of white, siliceous sandstone outcrop in Matilija Cañon. Some building stone was cut from boulders of this tough sandstone at Wheeler's Hot Springs for local use.

Santa Susana Quarry is in Sec. 16, T. 2 N., R. 17 W., S. B. M., 2 miles east of Santa Susana. Massive beds of buff-colored sandstone were quarried by the S. P. R. R. Co. and the stone used for rip-rap work on the roadbed. The sandstone proved to be too soft for this use. Idle.

Bibl.: Bull. 38, p. 327.

Sespe Cañon Brownstone Quarry, Geo. J. Henley et al., owners, is in Sec. 35, T. 5 N., R. 20 W., S. B. M. The quarry is 5 miles north of Brownstone Station, from which the stone is shipped. Large boulders and broken slabs are quarried by hand. Very little stone has been cut from the ledges, as the many boulders can be quarried at less expense. Worked for assessment only. For further details on the Sespe Brownstone, see Bull. 11, p. 26; Bull 19, p. 94.

Mr. Henley has taken a claim (120 acres) in Sec. 1, T. 4 N., R. 20 W., embracing a large exposure of hard, white, siliceous sandstone. This white sandstone rests conformably on the brownstone and has been described by W. L. Watts in Bulletin 11, p. 26. Worked for assessment only.

STONE INDUSTRY.

Under this heading are grouped crushed rock, sand and gravel. No production has been recorded since 1911, except a small amount of rip-rap in 1915. Ventura County has recently appropriated \$1,000,000 for the construction of highways in the county so there should be a revival of this industry in the near future.

Camarillo Quarry is in Sec. 5, T. 1 N., R. 20 W., S. B. M., 2 miles southeast of Camarillo. Opened in 1907 by the S. P. R. R. and was worked continuously until 1910. The company erected a large plant, consisting of a gyratory crusher, revolving screens, bucket elevator, etc., and a steam power plant for operating same. Coal was used for fuel. A spur track was built from Camarillo to the quarry.

The rock is a pinkish gray felsite, very irregular in character, grading into soft clay. Many thousand tons were used for ballast along the coast line of the S. P. R. R., but proved to be too soft for such use. The company is about to abandon the quarry and remove the plant.

Bibl.: Bull. 38, p. 327.

PART VI

San Bernardino County
Tulare County

By H. C. CLOUDMAN, EMILE HUGUENIN, F. J. H. MERRILL, Ph.D., and
W. BURLING TUCKER, Field Assistants

PREFACE.

The two counties herewith included present radically different features, both as to topography, climate, etc., and as to the industries. San Bernardino County, lying in the southeastern portion of the state, is mostly desert, and the development of its various mineral resources is its chief industry. The only portion of the county devoted extensively to agriculture is the southwestern corner. This has become famous for its orange groves. Tulare County embraces a large portion of the lower San Joaquin Valley extending on the east to the high Sierras, in which are located rich mineral areas. In the valley lands, agriculture is, of course, its dominant industry. Stock raising is an important pursuit in the mountains. The production of magnesite from the foothills in the vicinity of Porterville is now its most important mineral activity.

This report represents the result of several months' work in the field in which we endeavored to visit all active mineral properties and such undeveloped mineral deposits that held promise of future commercial exploitation.

Acknowledgment is here made of assistance rendered by the various owners and operatives, both during the field work and in subsequent preparation of this report.

SAN BERNARDINO COUNTY.

By H. C. CLOUDMAN, EMILE HUGUENIN and F. J. H. MERRILL, Ph.D., Field Assistants.

INTRODUCTION.

The following report on the Mines and Mineral Resources of San Bernardino County has been prepared as a result of field observations by the authors, covering the entire county. The preliminary field work was done by H. C. Cloudman during the winter of 1913-1914, and later work by F. J. H. Merrill* and Emile Huguenin up to July, 1916, particularly in those districts which have more recently become active, namely: Goldstone, Clark Mountain, New York Mountain, Signal and Vidal districts. It has been supplemented by field observations in the Atolia district in June, 1916, by Walter W. Bradley, mining statistician of the State Mining Bureau.

Grateful acknowledgment is here accorded to the numerous mine owners and operators for their uniform courtesy in assisting the writers in their investigations.

September, 1916.

FLETCHER HAMILTON,
State Mineralogist.

HISTORY.

This county, formed by act of legislature in April, 1853, is still the largest in the state, although in 1893, jointly with San Diego County, it contributed part of its territory to form Riverside County. Its present area of 20,157 square miles, exceeds that of the states of Massachusetts, Connecticut, Rhode Island and Delaware taken together.

It owes its name to the fertile valley south of the San Bernardino Range, which was visited by the Franciscan priests in 1810, on May 20th, the Feast Day of San Bernardino of Sienna, whose name was given to the old mission built, about that time, almost three miles west of what is now Redlands. This mission was destroyed by the Indians in 1812, rebuilt in 1820, and again destroyed in 1834, only slight vestiges now remaining.

In 1851 this valley was visited by Mormons from Salt Lake City who founded the city of San Bernardino.

TOPOGRAPHIC MAPS.

Many topographic sheets covering portions of San Bernardino County have been completed and published by the United States Geological Survey, most of them pertaining to the southwestern corner of the county, as follows:

*Mr. Merrill died November 29, 1916. He was State Geologist of New York, 1890-1904.

Scale 1 mile equals 1 inch, or $1 \div 62,500$.

Cucamonga, San Antonio, San Bernardino, Hesperia, Redlands, Deep Creek, Randsburg.

A number of the above are included in the Southern California Sheet, No. 1, Scale $1 \div 250,000$.

Scale 1 inch equals 2 miles, or $1 \div 125,000$.

San Gorgonio, Parker, Needles, Camp Mojave, Ivanpah.

General maps of the county have been compiled by J. S. Bright, Jr., once county surveyor, and by J. A. Sourwine, who now holds that office.

A county map on the scale of 1 inch equals $5\frac{3}{4}$ miles, has been published by the C. F. Weber Co., of 365 Market street, San Francisco.

Map of the Mojave Desert and adjacent region, compiled in 1908 by A. Russell Crowell, on the scale 1 inch equals 8 miles, covers the county from the Colorado River west to the meridian of $119^{\circ} 30' W.$, and from the Riverside County boundary north to the parallel of $38^{\circ} 30'$, and shows also the position of many mining districts and mines. Blue line prints of this are on sale in Los Angeles.

GEOLOGY.

This report contains little new detailed matter on the geology of San Bernardino County, as attention was paid more particularly to economic developments and exploitation. Much valuable geological detail will, however, be found in the Guide Book of the Western U. S., Part C, the Santa Fe Route, written by Mr. N. H. Darton and others, and issued by the U. S. Geological Survey, as Bulletin 613.

The earliest professional report on this region was by Professor William P. Blake, in Vol. V, of the Reports on the Pacific Railroad Expedition in 1852 under Lieutenant R. S. Williamson.

Additional matter will be found in Bulletin No. 308, of the U. S. Geological Survey, entitled a Geologic Reconnaissance of Southwestern Nevada and Eastern California, by Sidney H. Ball.

Of late southern California has been surveyed geologically by Robert T. Hill, under the auspices of the U. S. Geological Survey. His forthcoming reports on this subject will be exhaustive and of great interest.

TOPOGRAPHY.

The topography of this county is striking and varied, being essentially a combination of mountain ranges and desert plains. As the general details are characteristic of the Great Basin, a description of this will cover many features of this part of California.

Features of the Great Basin.

The Great Basin, to which the desert region of San Bernardino County belongs, is an elevated region in Nevada and contiguous por-

tions of Oregon, California, and Utah, comprising about 208,500 square miles.

The southwest corner of Wyoming, the southwest corner of Idaho, a large area in southeast Oregon, the west half of Utah, almost the whole of Nevada, much of southern California, and a strip along the east border of this last named state are embraced within the limits of



Photo No. 1. Characteristic exposure of tuffs near Victorville, San Bernardino County.
Photo by Walter W. Bradley.

the Great Basin. Its form is approximately that of a triangle, with one angle extending into southern California, west of the Colorado River; the northern side being formed by the south divide of the drainage basin of the Columbia River, the eastern by the west divide of the Colorado River basin, and the western by the central part of the Sierra Nevada crest, and by other high mountains. The northern boundary and much of the east limit is not conspicuously uplifted, being plateau, rather than mountain. None of its streams flow to the ocean, and in this it differs from all other provinces of the United States. The region is arid, the precipitation being less than 20 inches a year.

The Great Basin is not, as its name implies, a topographic cup. Its surface is of varied character, with many independent closed basins draining into lakes or "playas," none of which, however, has outlet to

the sea. The mountain chains, from their peculiar geologic character, are known as of the "Basin Range type" though not exactly continuous in distribution with the Basin, and are echeloned in short ranges trending north and south. Many of them are fault mountains, the crust having been broken and the blocks tilted so that there is a steep face on one side and a gentle slope on the other.

This is the basin range type of mountain. These mountains are among the most recent in the continent, and some of them, at least, are still growing. They are characteristically rugged and bare, though the crests of some of the higher ranges are covered by a scanty growth of timber. Associated with the ranges are low hill groups and mesas, many of which also, have a north and south elongation. From the mountains with distinct crests to the small hillocks in the desert valleys there is every gradation, and between the mountains and hills are broad, gently sloping valleys, of which branches extend into and, in places, across the mountains. The latter are cut by deep cañons, and a few of these form the channels of streams which descend to the valleys on alluvial fans and commonly disappear before the playas in the center of the valley is reached.

These valleys are enclosed basins which slope rather steeply next to the mountains, but decrease rapidly in grade, the central portion being a flat in which the eye can see no difference in relief. This level bottom is, in most cases, a *playa*,¹ which, during the greater part of the year, is a level waste of hard clay, but after heavy rains is covered by a thin sheet of water. By rain-wash and wind action detritus from the mountains is carried to these valley floors, raising their level, and often burying low mountain spurs, so as to cause neighboring valleys to coalesce. Hence, every hill within the area furnishes, each year, material with which it is slowly being buried by the constantly growing flat valleys. The borders of given valleys are, as a rule, approximately equal in elevation, though the desert gravels extend to greater elevations on the higher inclosing mountains. In such cases, while the slopes are of approximately equal descent, the *playa* is nearer the lower hills. Near the mountains the alluvial slopes are scored by numerous drainage lines, and hills protrude through their surface. Bays and arms of detrital wash extend from the inclosed basins into the mountains and, in places, two opposed arms meet and form a strait of alluvial material.

The plateau "lowlands" in the center of the Basin are approximately 5000 feet in altitude. Southward the altitude falls, Death Valley and Salton Sink being in part below the level of the sea. The whole basin is marked by three features of elevation—the Utah basin, the Nevada basin, and, between them, the Nevada plateau.

¹Spanish, (*playa*) shore or beach.

Mojave River.

This, the most important river on the desert of that name, is formed by the union of two branches, Deep Creek and West Fork, which have their origin in and near Holcomb Valley in the San Bernardino Mountain Range. The course is northerly for 70 miles, in an air line, then it takes an easterly direction for 60 miles and sinks into Soda Lake. Within the entire distance the river sinks and rises eight different times. Its first disappearance is at the junction of the forks 12 miles



Photo No. 2. The "Gibraltar of the Mojave" River at Victorville. The river here passes through a narrow break in a rough, rocky ridge which rises abruptly out of the plain. Photo by Walter W. Bradley.

above Victorville, whence its flow is subterranean. It appears again at Victorville (see Photo No. 2) and sinks again for five miles, reappears at Oro Grande and flows on the surface for five miles, sinking again at Cottonwood; is visible for one mile and then sinks for 15 miles, rises again at Barstow and is seen at this point for one mile, again sinking for six miles, and coming to the surface at Fish Pond. It then runs in view for one mile and goes out of sight for 12 miles; rises again near Otis and flows on the surface for one-half mile; then sinks until Camp Cady is reached. Here it is visible for one mile and sinks again for 18 miles, rising at Cave Cañon. From this point the flow is visible for 10 miles, and the river sinks for the last time near Soda

Lake (except in the season of floods) and, rising finally 20 miles below the lake, it unites with the Amargosa River and empties into Death Valley near Saratoga Springs. This river, the one stream that forces its way through the sands, apparently sinking and rising in flood time, floods itself over its "bottoms" and irrigates flats that yield rich crops of various kinds of feed that are well cared for and used to fatten stock in winter. These crops have given a very good idea of the productiveness of the desert soil when properly irrigated. Changes in the stream channel and in the rainfall have lessened the grazing area in late years, but other methods of irrigation are well on the way to success.

Colorado River.

Another river of much importance to San Bernardino County is the Colorado, which washes its eastern boundary for a distance of 90 miles. This river is formed in Utah by the junction of the Green and Grand rivers, which rise in regions of heavy precipitation, mainly in the form of snow. The Colorado emerges from deep cañons a short distance above Needles, and between this point and the Mexican border occupies a series of valleys which aggregate several thousand acres of arable land. In this region, the waters are heavily laden with sediment, which is a serious obstacle to their diversion, since the grade of the river is so slight that sufficient fall can not be obtained by taking the water out of the river in a short canal, and consequently a very long canal is required in order to command any considerable areas of land in the valley. Flat-bottomed boats and gasoline launches are used on the river near Needles and above it (see Photo No. 3) but, below this point, navigation is so difficult and precarious as to be practically of little importance. At low water the channel is so broad, shallow, and change-



Photo No. 3. Colorado River ferry near Needles, Cal.

able that boats are constantly running aground, and at high water the currents impair navigation. A few cable ferries are in operation near Needles, and carry across automobiles and other vehicles for a nominal charge.

TRANSPORTATION.

The development of San Bernardino County has been greatly augmented in recent years by increased transportation facilities, and at



Photo No. 4. Primitive transportation on the desert by burros.

present travel is accomplished with much greater ease and safety than heretofore. In former years the burro was the chief mode of conveyance, but of late this patient beast has been largely though not entirely

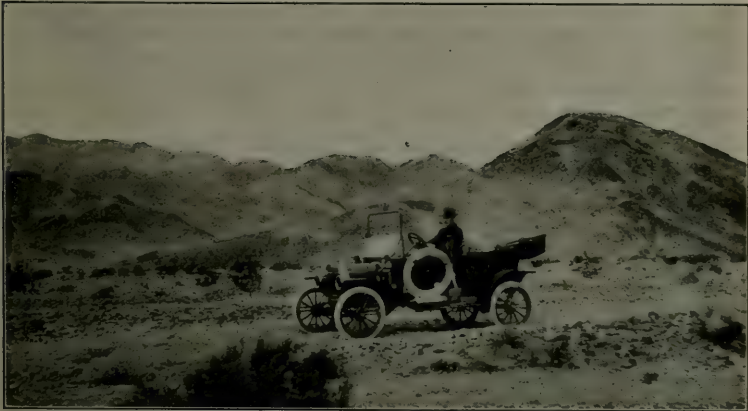


Photo No. 5. Modern transportation and desert mountains.

replaced by railroads and highways. We now have the Santa Fe, the Salt Lake, the Southern Pacific and the Tonopah and Tidewater railroads, giving access to the entire length of the county, besides the

National Highway now sufficiently complete to permit the use of the automobile. Nearly every section of the county can be traversed with the automobile, and numerous branches lead from the main lines of both railroads and highways.



Photo No. 6. A. T. & S. F. (Santa Fe) railway bridge over the Colorado River below Needles.

WATER.

Another factor in recent development is the increased facility for obtaining water. In early days the desert was considered dry and barren, but of late it has been proven that water can be obtained by digging or boring at almost any playa or "lake." Occasionally, in times past, springs of water were found rising to the surface, but in most cases their flow was not permanent and lasted only through the rainy season. Recent developments have shown that bodies of water lie beneath the sands and that it is not difficult to obtain water by deep drilling. The heavy expense of hauling water from remote points is now being eliminated by such wells.

MINING DISTRICTS.

The organized mining districts of San Bernardino County are discussed in the reports of the State Mineralogist, VIII, IX, X, XI, XII and XIII, and are shown on Plate V of Bulletin 507 of the U. S. Geological Survey, p. 114. The list is here given with their map numbers on that plate.

TABLE OF MINERAL PRODUCTION OF SAN BERNARDINO COUNTY, 1880-1915, INCLUSIVE.

Year	Gold value	Silver value	Copper			Lead			Borax value	Gypsum		Salt		Cement		Lime		Limestone		Brick (M)		Clay (tons)		Marble		Stone Industry value	Gem. Value	Miscellaneous		
			Pounds	Value	Pounds	Value	Pounds	Value		Tons	Value	Tons	Value	Barrels	Value	Barrels	Value	Tons	Value	Amount	Value	Cu yd feet	Value	Amount	Value			Amount	Value	Value
1880																														
1881	29,000	\$100,000																												
1882	20,000	150,000																												
1883	20,000	1,000,000																												
1884	22,000	2,500,000																												
1885	25,000	2,261,430																												
1886	56,461	1,301,750																												
1887	25,850	1,133,268																												
1888	25,000	1,200,000																												
1889	10,157	621,820																												
1890	17,135	785,465																												
1891	62,019	711,157																												
1892	17,407	67,662																												
1893	158,000	447,020																												
1894	135,420	148,213																												
1895	131,350	210,410																												
1896	96,723	130,714																												
1897	160,723	61,407																												
1898	20,512	32,000																												
1899	164,509	125,661	1,209,878	\$2,239																										
1900	247,419	112,559	1,030,000	297,000	10,000	\$100																								
1901	309,693	57,364	50,000	7,825	500	20	888,130																							
1902	390,006	58,912	338,680	11,008	60,340	2,070	2,198,400																							
1903	381,197	56,169	60,100	7,812	14,000	564	195,000																							
1904	172,688	13,225	169,477	17,250																										
1905	47,891	19,765	82,601	8,200																										
1906	354,859	81,765	141,021	90,207																										
1907	158,626	81,339	514,252	102,526	31,211	1,832																								
1908	189,511	35,704	516,940	71,679	409,570	17,218																								
1909	49,711	12,570	310,300	40,418	110,291	15,254																								
1910	55,691	10,161	5,412	669	134,312	5,972																								
1911	127,567	85,542	665,489	83,111	161,138	7,560																								
1912	290,000	49,802	1,997,185	519,636	94,852	4,268																								
1913	356,024	44,413	497,810	77,167	259,241	12,287																								
1914	205,000	40,000	10,000	2,536	45,110	1,739																								
1915	116,902	64,165	209,440	106,012	369,183	7,002																								
Totals	\$6,060,815	\$18,892,703	9,187,838	\$1,446,701	1,721,867	\$74,792	\$9,829,070	147,935	\$400,612	85,704	\$104,940	8,797,083	\$5,164,708	792,365	\$637,906	1,189,706	\$1,210,643	11,150,000	\$153,721	183,388	\$341,976	\$3,021,291	\$199,150							

*Combined annual production 1890-1901-1912

*Includes dolomite, gypsum, lime, magnesite, marble, mineral paint, soapstone and talc.

*Included under "other minerals."

Gold	50,000,000
Silver	1,492,200
Copper	1,410,200
Lead	74,200
Borax	9,829,070
Gypsum	449,012
Salt	104,940
Cement	5,164,708
Lime	637,906
Limestone	1,189,706
Brick	11,150,000
Clay	125,721
Marble	11,150
Stone	245,000
Stone	2,531,281
Gems	122,130
Miscellaneous	7,628,430
Grand total	\$24,000,000

Plate V, Map No.	Name of district	Metal mined
121	Alvord	Gold.
122	Arondo (Slate Range).....	Gold.
123	Arrowhead	Gold.
124	Atolia	Tungsten.
125	Blackhawk (Silver Reef).....	Gold.
126	Brightwood (Providence Mountains).....	Silver.
127	Bullion (Standard)	Copper.
128	Calico (Daggett)	Silver.
129	Cave Cañon	Iron.
130	Cima	Silver.
131	Cottonwood	Gold.
132	Crackerjack	Gold.
133	Dry Lake	Copper.
134	Garlic Spring	Iron.
135	Grapevine	Gold.
136	Hart	Gold.
137	Helen	Gold.
138	Holcomb	Gold.
139	Ibex	Gold.
140	Iron Mountain	Iron.
141	Ivanpah (Copper World).....	Copper.
142	Kane Springs	Copper.
143	Kelso	Iron.
144	Kewanee	Gold.
145	Kingston Range	Iron.
146	Knob Peak	Gold.
147	Lava Beds (Newberry).....	Gold.
148	Monument Peak (Whipple Mountains).....	Copper.
149	Morongo (Lone Valley).....	Gold.
150	Needles	Gold.
151	New York (Manvel, Barnwell).....	Gold and tungsten.
152	Ord	Gold and copper.
153	Oro Grande ²	Gold and silver.
154	Owl Holes	Manganese.
155	San Antonio	Gold.
156	Shadow Mountains	Copper.
157	Signal (Vontrigger)	Copper and tungsten.
158	Silver Mountain ²	Gold and silver.
159	Spangler	Gold.
160	Stedman	Copper.
161	Stringer	Gold.
162	(Omitted)	
163	Trojan (Providence)	Gold.
164	Twenty-nine Palms	Gold.
165	Vanderbilt	Gold.
166	(Omitted)	
167	Virginia Dale (Monte Negro).....	Gold.
168	(Omitted)	

²Silver Mountain was formerly the same district as Oro Grande.

MINERAL RESOURCES.

In describing the mineral deposits of a given county the alternatives are presented of discussing them separately or in connection with the mining districts in which they occur. Since, however, most districts include many useful minerals, a more satisfactory review of the subject can be given by taking the various products separately and stating their distribution with the conditions of their occurrence.

This plan will, accordingly, be followed in this report, the metals being taken up first, in alphabetical order; followed by the non-metals likewise.

METALS.

Among the mineral products of this county some of the metals are foremost in their totals of value, as will be noted by the table of total yield.

Tungsten has been produced since 1905, but there being only a single operator in the county up to 1915, the output for San Bernardino for that period can not be segregated. The production of tungsten for 1915 exceeds the sum of all other metals in the list, except gold.

COPPER.

Throughout the mountain ranges which traverse the Mojave Desert in this county useful minerals and metallic ores abound. Among the latter, copper is widely distributed, though mainly in quantities too small for commercial exploitation. As with many other resources of this great mineral field, there has been but a small beginning made in the prospecting and development of the copper deposits of these rugged hills, though there is a considerable number of more or less promising copper claims showing superficial development.

The largest amount of copper produced in the county has been from the Copper World Mine, fully described in our Bulletin 50, "Copper Resources of California." However, the work in recent years has been confined mostly to those mines in the southeastern portion of the county in the vicinity of Vidal. The reader is referred to the above mentioned bulletin for description of the old copper mines and prospects, most of which have been idle since the publication of that report.

Amazon Mines in the Silver Mountain mining district, six miles east of Oro Grande, consists of six claims. Oxides of copper occur in a contact vein between limestone and diorite. Development consists of two shafts, 265' and 175' deep respectively, and several tunnels. About 300 tons of sorted ore were shipped several years ago. Idle: worked for assessment only. Owners, F. H. Cline et al., Oro Grande, Cal.

Bibl.: Report XI, p. 363; XII, p. 69; XIII, p. 60.

American Eagle Group, consisting of 19 claims in the Whipple Mountain mining district, is in Sec. 32, T. 3 N., R. 4 E. S. B. M., 13 mi. north of Vidal, the shipping point. Mine is opened by a shaft. There is said to be large body of low grade sulphides exposed, varying up to 10% copper and from \$2 to \$21 in gold. The values are erratic. One car shipped to smelter a few years ago assayed 6.35% copper, however, the company was penalized due to a high silica content (65% to 75%) and received no returns. Idle until recently. Ten men are now employed in development work under supervision of J. B. Baker. Owner, American Eagle Gold & Copper Co.; president, A. L. Crew, 419 Homer Laughlin Bldg., Los Angeles.

Bibl.: Bulletin 50, p. 337.

Big Butte Mine, in the Ibex District, is six miles west of Needles. Elevation 1100'. Development consists of a 125' shaft and numerous short tunnels and open cuts. Ore contains gold, silver, and copper. One carload was shipped to Needles during 1913. Idle. Owner, K. K. Horan, Needles, Cal.

Black Diamond Mine in the Silver Mountain district is eight miles east of Oro Grande. Gold, silver, and copper occur in a vein along contact of a porphyritic dyke and granite. Opened by a 150' shaft and several small cuts. Idle. Owner, Joseph Scheerer of Victorville.

Black Mountain Mining Company has a group of 96 claims, in Sec. 36, T. 10 N. R. 21 E., $9\frac{1}{2}$ miles west of Needles. Idle. Nick Jahriess of Needles, president.

Bumper Group, Needles district, consists of six claims, 12 miles south of Needles. Elevation 1200'. The ore is said to contain malachite, azurite, franklinite and zincite. It is exposed by shaft 22' deep and a tunnel 65' connecting with the bottom of the shaft. Worked for assessment only. Owners, E. H. and H. A. Norton, Needles, Cal.

California Gold and Copper Company's Mine, Signal district, is nine miles north of Goffs and $1\frac{1}{2}$ miles east of Vontrigger and consists of nine patented claims. Elevation 3700'. The country rock is diorite, porphyry and granite. The ore carries malachite, azurite, chalcopryrite, bornite, pyrite and gold. It is said to average 4% copper. Development consists of three shafts, 317', 150', 100' deep respectively, and over 5000' of underground workings. A 15 h.p. Fairbanks-Morse hoisting engine is installed at the main working shaft. The reduction plant consists of rock breakers, arrastra and a 160-ton cyanide plant. The copper is separated electrolytically on copper plates. The plant is operated by electricity generated by a 100 h.p. Fairbanks-Morse gas engine. The reduction plant was erected in 1913—started operating in 1914. Idle for past year. A. H. Cram of Riverside is president. This property has recently been taken over under lease and bond by L. H. Mitchell and Sons of Los Angeles, who are to reopen the mine and put the mill into activity shortly.

Camp Vera Group is in the Morrow mining district, 25 miles north of Barstow. Idle. Owner, W. J. Rodgers, Barstow.

Bibl.: Bull. 50, p. 334.

Copper King Mine is in the Ivanpah district, 12 miles west of north of Cima, a station on the Salt Lake Route. The mine has been idle for several years.

Bibl.: Bull. 50, p. 330.

Copper Mountain Mining Company, Silver Mountain district. The mine is worked for assessment only.

Bibl.: Bull. 55, pp. 335-336.

Copper World Mine, Ivanpah district, is in the Clark Mountains, 20 miles northwest of South Ivanpah, the terminus of a branch line of the A. T. & S. F. R. R., leaving the main line at Goffs. The elevation at the mine is 5300'. This property is said to have produced over \$750,000. A smelter was erected at Valley Wells, five miles southwest of the mine, and the ore hauled by team to it. The smelter was abandoned, due to the high cost of smelting and the losses in the slag. The ore was later shipped to Needles. The mine has been recently reopened after having been idle for several years. The dump is now being shipped via Cima to the Needles smelter. Six men are employed at the property.

Bibl.: Rep. XIII, p. 61, Bull. 50, pp. 326-328.

D. & W. (Dayton & Wilbur) Mine, Whipple Mountain district, is 13 miles north of Vidal, adjoining the American Eagle Group. Elevation 1800 feet. The ore containing malachite, azurite and gold, occurs in a quartz porphyry in diorite. Mine is opened by a 750' shaft and over 5000' of underground workings. Equipment consists of an 18 h.p. Western engine for hoist; 35 h.p. engine for mill; 45 h.p. Commercial gas engine for compressor. Air drills are used. A 10-ft. Lane Mill rated at 50 tons capacity was installed in 1913, but was worked only a short time. There has been very little ore produced and only a few test runs made at the mill. Idle for the past two years, but resumed work on a small scale in April, 1916. Owner, D. & W. Mining Co., 708 San Fernando Bldg., Los Angeles; secretary, Joseph Simon.

Bibl.: Bull. 50, p. 337.

Desert Butte Group is 40 miles southeast of Amboy and $3\frac{1}{2}$ miles south of Kilbeek Siding, on the Parker branch of the A. T. & S. F. R. R. The ore is said to contain copper, gold, silver, lead and zinc. The greatest vertical depth below the outcrop is 45': the vein is exposed by a drift tunnel 325'. At the time visited (April, 1914) had 40 tons of ore ready to ship to Selby. Owners, Geo. B. Parks and A. J. Crowley, Barstow, Cal.

The Desert Queen Copper Mines Company is working a property in the northern portion of the county, east of the Tonopah & Tidewater Railroad, and reported to be hauling a fairly high-grade ore by auto trucks to Baker, Cal., for shipment to the International smelter in Utah.

Giant Ledge Gold and Copper Mines, New York Mining district, 10 miles northwest of Ledge, a station on the Ivanpah branch of the Santa Fe R. R. Elevation 5,700 ft. Idle for past four years. Owner, Giant Ledge Gold & Copper Company, 500 Frost Bldg., Los Angeles, L. M. Gregory, president.

Bibl.: Bull. 50, p. 333.

Hercules Group in the Hikorum (Old Dad Mountain) district is nine miles north of Bagdad. Elevation 3200'. The principal forma-

tion is granite, underlying schist. The veins occur in a fine-grained quartz porphyry and carry the carbonates and oxides of copper with some values in gold. Development consists of a 42' shaft and several hundred feet of open cuts. Said to have shipped to Needles about 1400 tons of ore varying from \$6.00 to \$8.00 per ton. Now worked only for annual assessment. Owner, Robert Andrews of Bagdad.

Hermit Mine, formerly called the Blue Jacket, is in the Silver Mountain district four miles east of Oro Grande. Elevation 3500'. Worked in the early '80s at which time a mill was erected at the property. Relocated 1910 by present owner. Now worked for assessment only. Owner, H. L. Atwood of Oro Grande.

Bibl.: Report VIII, p. 500.

Hidden Hill Mine (see under Gold).

Home Mine in the old Hikorum (Old Dad Mountain) district 12 miles north of Bagdad. Elevation 2960'. Oxides of copper are said to occur in a quartz vein in granite, which also carries low values in gold. A 75-ft. shaft was sunk on the vein. There has been no production and the mill is idle. Owners, L. V. Root and Jos. Luxon, Needles, Cal.

Hoosier and Missouri Groups are in Sec. 28, T. 10 N., R. 3 W., S. B. M., 12 mi. northwest of Barstow. The ore carrying values in gold, silver, copper and lead occurs in a quartz ledge, said to vary up to 15' in width on a contact of rhyolite and granite. Development consists of a 90' shaft and 300' of drifts. Now worked for assessment only. Owners, J. W. Foglesong and E. Troutmen of Barstow.

Ivanpah Mine, Ivanpah district. Idle.

Bibl.: Bull. 50, p. 330.

Ivanpah Mammoth Mine. Idle.

Bibl.: Bull. 50, p. 330.

Juanita Group, in the Morrow district, adjoins the Juanita mine. Idle for many years.

Bibl.: Bull. 50, p. 335.

Juanita Mine, in the Morrow district, 26 miles east of Johannesburg. Idle. Owner, Union Development Co. of Boston, Mass.

Bibl.: Bull. 50, p. 335.

Josie K. Mine, in the Ibex district, is six miles west of Needles and three miles south of Hartoun, the nearest shipping point. Elevation 1000'. Oxides of copper and gold occur in a quartz vein at contact of rhyolite and granite. Ore said to assay up to \$11.00 gold, and 14% copper. Vein is exposed along the strike for 4000' by a series of shallow shafts. No recent work has been done and the mine is idle. C. E. Kane of Needles, owner.

Leastock (Leastalk?) Gold and Copper Company, Barnwell district. Idle. L. M. Gregory, No. 500 Frost Bldg., Los Angeles, is manager.

Bibl.: Bull. 50, p. 330.

Needles Mining and Smelting Company,³ (formerly the Arizona-Mexican Mining and Smelting Company) is a subsidiary to the U. S. Smelting, Refining & Mining Co.; D. R. Muir of Needles is manager. The old company, which practically consisted of the same parties as the Cocopah Company, bought out the Fletcher Smelting Co. and erected a new plant on the side of the old one, a short distance northwest of Needles, on the bank of the Colorado River. The plant consists of one lead furnace, one copper furnace, one roasting furnace, crusher and sampling floor, assay and general office. The lead furnace is 120" x 42", with six water jackets, one in front, one in rear, and two on each side, boshed; automatic lead well; eight tuyeres on each side; sheet iron hood and pipe descending into dust chamber. This type of furnace is known as a 100-ton furnace, although it can attain this capacity only with exceptionally favorable ores.

The copper furnace consists of an oval, iron water-jacket from the crucible to the feed floor (14 feet above) 96" x 36", with ten tuyeres and iron hood, the same as the lead furnace. Notwithstanding its similar size, its capacity is greater than that of the lead furnace, owing to the faster smelting of copper ore. The roasting furnace is of the McDougall pattern, a huge iron cylinder, nearly 30 feet high, with six separate compartments all connected. The fire place is under the lowest one, but coal has been replaced by oil, and two pipes furnish the necessary fuel. The ore is charged from above, a vertical shaft rotating in the center, furnished with arms to which blades are attached, keeps stirring the pulp and moving it continually from one compartment to the other until it drops out from the last one, being finished. This roaster gives great satisfaction and forms a very essential part of the plant, because the ores treated are mostly sulphides, and most of the iron required for fluxing is obtained by roasting pyrites. Incidentally a little copper matte is obtained from the lead furnace, but the bulk of the copper ore is smelted by itself in the special furnace, in a manner different, however, from the process used at the Valley Wells smelter. No attempt is made to obtain metallic copper directly from smelting the oxides, because it has been found that this method entails too great a loss in the slag and that it is more advantageous to save the copper values in the form of matte. Sufficient sulphides are therefore added to the oxidized copper ores to produce a high-grade matte, which is shipped East for further treatment.

New York Mine (*see* Sagamore mine).

Orange Blossom Mining and Milling Company, Hikorum (Old Dad Mountain) district, nine miles north of Bagdad. Idle.

Bibl.: Bull. 50, pp. 338-339.

³Bull. 50, pp. 330-331.

Orange Blossom Extension Mine, in the Hikorum district, adjoins the Orange Blossom Group on the north. The ore is deposited in a contact vein between granite and birdseye porphyry. The vein varying from 4' to 20' carries quartz, iron and lime with values in gold, copper (mostly oxides) and a little silver. The mine is opened by a 715' shaft and over 4000' of levels, drifts, raises, etc. A 25 h.p. Fairbanks-Morse hoisting engine was installed at shaft. A mill was erected in 1913, consisting of eight Nissen stamps, one Wilfley table and one Frue vanner. The power is supplied by a 60 h.p. Fairbanks-Morse gas engine. Electricity for pumping and lighting purposes about the plant is generated by a 25 h.p. Fairbanks-Morse special electric direct connected engine. Water is brought to the mine from a spring in Old Dad Mountains by a 4" and 5" pipe line; however, it is reported that sufficient water for working purposes can be pumped from the bottom of the shaft. Mill ran only a short time and property is now idle. Owner, Hope Mining Co., president L. N. Root, Needles, Cal.

Bibl.: Bull. 50, p. 340.



Photo No. 7. Orange Blossom Extension Mine.

Osborn Group, in Ord Mountain, is 14 miles southeast of Daggett, and consists of nine patented and eight unpatented claims. Elevation 5000'. The ore occurs in a contact vein, which it is said can be traced for several miles. The hanging wall is granite and the footwall decomposed porphyry. Copper is deposited both as the carbonates and sulphides. A great amount of development work was done. Ore was concentrated at a small custom mill one mile north of the mine, then shipped to the smelter. It is said to have produced \$20,000, but is now idle. Owners, Bert Osborn et al., Daggett, Cal.

Bibl.: Rep. X, p. 528; XII, p. 234; XIII, p. 326; Bull. 50, p. 336.

Pacific Mines Corporation (formerly the Bagdad, Chase, and Roosevelt Consolidated) office 1219 Hollingsworth Bldg., Los Angeles; Frank A. Keith, president; Geo. D. Mendenholt, general manager. This company's property, consisting of 27 patented claims, is seven miles due south of Ludlow. A railroad connects the mine with Ludlow. The ore is deposited in an igneous mineralized breccia zone formed by a fault. This brecciated zone strikes E.-W. and dips 25° to 35° N. Its average width is from 12' to 15'. It has been proven on the surface along its strike for 2,000'. The ore is mainly chalcocite and pyrite carrying values in gold and is in a quartz porphyry gangue. Development consists of a main working shaft 450' on a 40° incline, also shafts of 200', 140', and 120', respectively, all sunk on the ore body, with several thousand feet of levels, drifts, etc. The shafts are all equipped with gas engine hoists. A two-stage Sullivan compressor supplies the necessary air for the pneumatic drills. The ore, about 100 tons daily, is shipped to the United Verde Copper Company's smelter at Jerome, Arizona. Sixty men are employed. This property has been the most productive one in San Bernardino County since its operation by the present company.

Rosalia Mining and Milling Company owns a group of copper claims three miles west of Hartoun in the Ibex district. Very little work has been done on this property and no copper was produced. There is said to be 60 tons of ore on dump which assays \$17.00 per ton gold and 4% copper. Idle. C. E. Kane of Needles, president.

Rose Mine (see under Gold).

Sagamore Mine (formerly known as the **New York Mine**), is on the southern slope of the New York Mountains, about 10 miles west of Purdy, a station on the Ivanpah branch of the Santa Fe Railway. The elevation at the mine is 5800 feet. This old property, consisting of 8 claims, was first worked over thirty years ago, but lay idle for many years. The recent discovery of the unsuspected presence of tungsten in the ore has led to considerable activity, and a small concentration mill has been erected. The ore, which occurs in well defined quartz veins, is base, carrying sulphides of iron, copper, lead, zinc, and antimony, with oxides of copper, rhodochrosite, wolframite, and low values in gold. It is proposed to recover the wolframite from the concentrate by a magnetic separation. Fifteen men are employed. Owner, Sagamore Mining Company of Philadelphia; William C. Doak, superintendent at mine, Goffs, Cal.

Bibl.: Bull. 50, pp. 331-333.

Standard Mine, in the Ivanpah district, 15 miles north of Cima and 3 miles north of the Copper King Mine. Some copper ore was shipped from here, but no mining has been done in recent years.

Bibl.: Bull. 50, p. 330.

Three States Mine, in the Silver Lake district, 6 miles west of Silver Lake, consists of 3 claims named Arizona, Nevada, Utah. The country rock is limestone intruded by porphyritic and dioritic dykes. The ore is chalcopyrite. Shipped a few tons to the smelter several years ago, but due to the high cost of transportation and smelting charges, little profit was realized. Owners, T. R. Whelan, Percy McCabe, and C. Yake, Silver Lake, Cal.

Tuscarora Mining and Milling Company is developing a mine in the Whipple Mountain district, 7 miles northeast of Calzona. The vein between a schist footwall and diorite hanging varies from 5' to 10' in width and is proven on the surface for 2500'. The ore is free milling and said to average $2\frac{1}{2}\%$ copper and \$10 to \$25 gold and is shipped to the smelter. Mine is opened by a shaft which is equipped with a 12 h.p. Western gas engine hoist. Five men are employed. John Jarvis, Vidal, superintendent.

Vidal Mining Company's mine in the Whipple Mountain district north of Vidal, has been idle until very recently. Now under lease to P. H. Newman. No records are available as to its former production.

Winifred Group, Old Dad Mountain district, is 9 miles north of Bagdad, near the Orange Blossom mine. Development consists of a 300' tunnel and a couple of winzes. A few tons of ore, said to have assayed 12% copper and carrying values in gold up to \$200, were produced several years ago. No recent work has been done and the property is idle. Owner, F. P. Seburn and Bro., Needles, Cal.

The following **Copper Mines** or operators in San Bernardino County made shipments of ore, in varying amounts, during the year 1915:

Name	Values in
John W. Brunk, Vidal, Whipple Dist.....	Copper
Maricopa Queen Oil Co. mine near Milligan.....	Silver, copper
Office 434 First National Bank Bldg., Long Beach.	Lead, gold
W. T. Brayton, secretary. Mine leased to Desert King Mining Company.	
Pacific Mines Corporation, Ludlow.....	Copper, gold
Office, 1219 Hollingsworth Bldg., Los Angeles.	Silver
Frank A. Keith, president; Geo. D. Mendenholt, Gen. Mgr.	
Pioneer Mine, J. F. Marrs, Cima.....	Copper, silver, gold
Geo. Sumner, Vidal.....	Silver, copper
Mark Genemiel, Vidal.....	Copper, silver
J. Jarvis, Vidal.....	Copper, silver
R. P. Gilliland, Vidal.....	Copper, silver

In addition to the above, the following were developing and expect to ship ore during 1916:

Henry Roberts and Burkes Bros., Calzona.....	Copper
Vidal Mining Co., Calzona; R. H. Newman, lessee.....	Copper

GOLD.

This precious metal has long been mined in San Bernardino County, and, in 1915, its production amounted in value to \$416,967, and a total of \$6,086,815 from 1880-1915, inclusive, there being no segregated data earlier than 1880.

In discussing its distribution it is deemed necessary to use a geographic classification of the known deposits and productive mines. Therefore, the following grouping is adopted as convenient:

There are, in this county, two chief groups of auriferous veins:

A. Those of the San Bernardino Range.

B. Those of the desert ranges.

In connection with the members of both groups are areas of placer gravel which have been worked with some success.

A. Veins of the San Bernardino Range. These occur mainly on and near the north slope of these mountains and close to the south margin of the Mojave Desert. The chief districts are: Bear Valley, Black Hawk, Holcomb Valley, and Morongo districts, gold.

B. The chief districts of the desert veins are: Arrowhead, Dale, Goldstone, Ivanpah, Ord, Oro Grande, Steadman, Twenty-nine Palms and Vanderbilt. The only placer ground recently worked on the desert is that north of Barstow by the Cool-Gardie Mining Company.

SAN BERNARDINO MOUNTAIN GOLD BELT.

This auriferous zone, the largest in the county, has a southeasterly trend, and is mainly confined to the four ranges of public lands east of the San Bernardino Meridian, extending three townships north of the San Bernardino Base Line.

As noted by Mr. W. H. Storms,⁴ the main range of the San Bernardino Mountains, of which the axis trends southeast, is granite, and, also, the country adjacent, extending northward to the south side of Bear Valley. On the north side of Bear Valley, limestone occurs, and farther north quartzite and mica schist, uptilted and fractured by intrusive granite. The metamorphic rocks, which are limestone, quartzite, and mica schist, the latter occurring in relatively small amount, are members of a series which extends from near Twenty-nine Palms northwesterly along the north flank of the San Bernardino Mountains to West Camp, 12 miles northwest of Victorville, a distance of 85 miles. Remnants of limestone occurring southeast of Twenty-nine Palms in the Ophir Mountains, indicate that this limestone formation is over 130 miles in length. Throughout this distance at several points, quartzite appears, being well developed at Oro Grande, about Bear Valley, Holcomb Valley, and southeastward as far as the Ophir Mountains, which lie south of the Monte Negro District and north of Eagle

⁴Rept. XII, p. 229.

Mountain. Gold, silver, and lead occur along the entire length of this belt. The strata are everywhere very much disturbed and shattered. Granite dykes cut the sedimentary rocks, which are faulted, crushed and folded. Dykes of diorite, felsite, and porphyritic rock also play an important part in this connection. The mines have been developed where the greatest disturbances seem to have occurred. A notable instance of this is seen in the Gold Mountain mine.

West of the San Bernardino Range, gold is found at intervals for a long distance through the San Gabriel Range into Los Angeles County. The westernmost occurrence is at the Dawn mine, on the south slope of Mount Lowe. Farther east, gold has been found in the gravels of San Gabriel Cañon, and on the west slope of Mount San Antonio, as well as on its north and east slopes, where some placer channels have been worked.

Discovery of Gold in San Bernardino Range.

Prospecting had begun in the San Bernardino Range as early as 1859, and in May, 1860, substantial discoveries of this metal were made in Holcomb Valley and Bear Valley, and productive mining began in the same year. About the same time, gold was found in the placers of Lytle Creek. Here in 1867 a New York company installed a plant for hydraulic mining and operated for some time with an extraction, it is said, of \$2000 per week.

Placers of Lytle Creek.⁵

This creek has its source on the east slope of Mount San Antonio, where are the headwaters of its North, Middle and South Forks, and the auriferous gravels are found from the slopes of Mount San Antonio to near the mouth of Lytle Creek Cañon. The gold is mainly in river terraces, which rise 150 feet or more above the valley bottom.

From the mouth of the cañon northwesterly, 5 miles to Pratts, there is more or less pay dirt, and considerable work was once done here. The available places, however, are nearly exhausted, and work has been discontinued for a long time. At Texas Point, some \$80,000 is reported to have been taken out by the hydraulic process, which was here first used in this county. Above this point the bottom of the ravine spreads out in flats, covered by large granite boulders.

Quartz veins, bearing gold, occur at many places among the cañons and on these, more or less mining has been done in past years, but none of them are now actively worked.

The placers were first worked in 1860 and since that time some gold has been recovered at intervals.

In June, 1894,⁶ fifty men were at work along the stream, and this number was augmented almost daily by new arrivals, until upwards of

⁵Rept. XII, p. 233; XIII, p. 324.

⁶Rept. XII, pp. 233-234.

100 men, mostly working independently, were engaged in gold washing. Four miles above the old Texas Hill mines, hydraulicking was carried on in a small way, and it was generally believed that all the miners engaged in sluicing, rocking and hydraulicking, were doing well.

At present, 1915, little is being done except with dry washing machines; since the heavy drafts made on the water supply by agricultural areas near Rialto interfere greatly with the use of water for mining.

San Antonio Placers.⁷

On the northern slope of San Antonio Peak, at an elevation of 8140 ft., an old river channel of auriferous gravel was discovered in the summer of 1882. In many respects this gravel resembled that of the Pliocene beds so extensively worked in the middle and northern counties of California. The gold was 900 fine. This channel was developed by three companies, each owning 1500 feet of ground.

In 1889 the Bald Mountain gold mines were in successful operation; the width of the channel, ascertained by crosscuts being 200' to 250'. Its course was northwest. The workings of 1889 were on the westerly rim of the channel.

Water was obtained from melting snows and caught in reservoirs of small dimension. It was used under 300-ft. pressure head through a 6-inch pipe, with 2½" x 3" nozzle.

The season was necessarily short, commencing in May and ending in November. The gravel first passed over a grizzly, then through three 16-foot boxes, 16" wide and 24" deep, set at 16" grade to the box.

Quicksilver was not used in the boxes or ground sluices, but in the under-currents; cross riffles, 2"x4", 1½ inches apart, were used in the boxes, set at a sharp angle.

The mine was worked only by day, but the yield was reported at \$8.00 daily to the hand. Six men were employed.

At the head of the San Gabriel Cañon in Los Angeles County, northwesterly from this point and at about the same elevation, the same character of gravel was seen.

The gravel banks of the San Gabriel River were claimed to be rich, and several companies were formed to work them, but for some reason all the projects fell through. At one time an English mining company was organized but suspended after incorporating and selling a few shares of stock.

Bear Valley District.⁸

This district lies along the valley of Bear Creek, southeast of Holcomb Valley district, and 25 miles northeast of San Bernardino city, occupying part of T. 3 N., R. 1 E. and R. 1 W. It is situated on the

⁷Rept. IX, p. 237.

⁸Report X, p. 522; XII, p. 229; XIII, p. 320.

northerly slope of Mount San Bernardino at an elevation of 5000 feet above sea level. It is well timbered and watered, the forest consisting of conifers of large size, suitable for lumber, much of which has been sawed in the valley. A project was long ago mooted to construct a large V-flume for floating timber, which would have been of advantage.

At the outlet of the valley, a substantial and costly dam was built having a capacity to store 8,000,000 gallons of water. The dam abuts against the rocky sides of the narrow gorge that forms the outlet, arching inward, with the arc of a circle 345 feet in diameter. It is 20 feet wide at the bottom and slopes up to 3 feet of width at the top, which is 60 feet above the bedrock foundation. This dam is considered able to withstand 20 times the pressure to which it will be ordinarily subjected when the reservoir is full. The structure is composed of large granite blocks, quarried on the banks of the reservoir, laid in Portland cement, and the interstices are filled with beton. One thousand six hundred barrels of cement were used. The lake formed by the dam, known as Great Bear Lake, extends over 5 miles back into Bear Valley, with an average width of 1 mile and a depth of 12 feet.

This mining district is wholly a placer field, and has been worked at intervals since 1860, but nothing is being done there now.

Along the spurs extending into Bear Valley from the high hills on the south may be seen remnants of an ancient river channel. The wash consists of well rounded pebbles and cobbles of granite, quartzite, slaty rocks, and some eruptives, all of which are foreign to the immediate neighborhood, except the granite. This wash material is bedded in coarse granite sand. The cemented wash was "prospected," as was also the concentrate from natural erosion in some of the adjacent gullies which cut the deposit, but in no case was gold discovered. The cemented wash is usually covered with a heavy accumulation of angular and sub-angular cobbles, mostly of quartzite and fine granitic sand and rock fragments.

The Rose Mine⁹ (quartz) is in T. 2 N., R. 3 E., 65 miles northeast of San Bernardino, and about 15 miles east of Great Bear Lake. Geologically the mine is an unusual one, consisting of a succession of ore shoots or chambers along a line of fracture which extends east and west, dipping about 45° N. The fissure cuts at a small angle through crystalline limestone, quartzite, and mica schist, being usually accompanied by a granite dike which is never absent where an ore body is found. The ore bodies occur in regular form and size, and are chiefly a mixture of quartz and calcite, with a varying but usually large amount of scaly hematite (sometimes containing as much as 45% of iron). The gold occurs in a greater or less amount, depending on the

⁹Report XII, p. 234.

proportion of iron. Heavy hematite ore has been shipped in considerable quantity, containing \$200 to \$500 per ton in gold. Owing to the fact that the gold is covered with a film of iron oxide, a simple stamping of the ore has been found insufficient to render the particles easily susceptible to amalgamation, and a subsequent grinding of the tailings has been resorted to with good results. The mine is equipped with a 5-stamp mill and grinding pan. In 1894 a large quantity of tailings were reground. The main incline, at some distance from the surface, passes from the fissure into the hanging wall. This shaft is sunk at a point where the series of ore chambers reach the surface. As depth is attained, the ore passes to the west, and at the bottom of the shaft, 450 feet in depth, the ore lies nearly 300 feet west. The lower western portion of the mine was being diligently prospected in July, 1894, for new ore bodies, with very favorable indications of the close proximity of a "shoot." That portion of the property lying east of the main shaft, while not neglected, has received comparatively little attention, and the existence of an ore body in that direction remains to be determined. No considerable amount of crosscutting has been done, though the appearance of the ground, in many places, suggests the advisability of such a course. The high grade of the ore and its unusual geological features attracted much attention, and were an incentive to a large amount of prospecting in the vicinity. This mine is now being worked under lease to O. J. Salisbury, Fret Bldg., Salt Lake City, Utah. The Morongo Mining Company of Riverside, Cal., owners.

Christie Mine (quartz). See Report XII, p. 231. This is near the head of Lone Valley, adjoining the Rose mine on the west. The ore shoot discovered in the Rose mine, near the surface, was found to pitch west into the Christie, as depth was attained. The development consists of a vertical shaft.

Gem Mine (quartz).¹⁰ In Lone Valley, 45 miles east of Victor, adjoining the Christie mine on the north. It has a 4'x7' two compartment shaft, 90 feet deep. There is no machinery at the mine. A. G. Watts was formerly the owner.

Gold Mountain Mine¹¹. This is in Secs. 6 and 7, T. 2 N., R. 2 E., 7 miles northeast of Bear Valley Lake, and 36 miles east of Victorville, at an elevation of 7000 feet, on a quartzite mountain 8000 feet in altitude, overlooking the Mojave Desert. The surface formations are quartzite, schist, granite, and silicified limestone, while the ore is on the contact between quartzite and schist. The quartzite is greatly shattered, and in some places crushed and pulverized. In those portions which sustained the greatest amount of crushing, irregular bodies

¹⁰Report XIII, p. 321.

¹¹Report XII, p. 232; XIII, p. 322.

of massive quartz have been formed, and these quartz bodies contain the greatest amount of gold. A close inspection of the quartzite at some distance from any of the ore bodies of this mine shows the frequent occurrence of finely disseminated pyrite. From this it appears that the crushing of the quartzite afforded an opportunity for the deposition of the pyrites in considerable quantity through large areas of the rock, and also for the infiltration of gold-bearing solutions derived from the normal rock, into those portions prepared by crushing for their reception, thereby mineralizing the crushed zones. That all, or nearly all, the stained quartz contains gold in small quantity there is little doubt.

Water is obtained by pumping, from an artesian well and from what is known as "Baldwin Lake." The 40-stamp mill, once on the property, was burned, after which time nothing was done until 1893, when a new experimental mill and cyanide plant were built. These were abandoned after a short trial.

This property was formerly owned by the De Lamar Gold Mountain Mining Company and at that time was controlled by E. J. Baldwin and associates of San Francisco. Until recently it has been owned and operated by T. H. Oxnam, late of Los Angeles and Victorville, but now deceased. The company's name is **Gold Mountain Mines Company** with offices at Doble, San Bernardino County. The officers were: T. H. Oxnam, president; A. B. Menefee, secretary.

The Black Hawk District.¹²

The Black Hawk District is located 40 miles by road southeast of Victorville in the north side of the San Bernardino Range. The topography of this region is marked by some notable features. Traversing it centrally and opening out on the Mojave Desert is a deep gorge known as Lookout or Black Hawk Cañon, with a heavy gradient and precipitous sides; that on the west being in places almost vertical. Towering above the walls are rough crags of granite gneiss and porphyry. Striking across the broken and rocky region is a heavy belt of stratified limestone 5 or 6 miles in width, overlying a lode, or more properly speaking, a bed of auriferous quartz mixed with spar, which can be traced on its exposure for a distance of 2 miles on the west side of the cañon. This ore bed is soft and loose, and is underlaid for the greater distance with porphyry, changing at some points to syenite and micaceous slate. Its average thickness is 30 ft., though it varies from 10' to 50'. It dips to the southwest at an angle of 35° to 45°.

The pay ore occurs in chimneys or shoots, separated from each other by intrusions of porphyritic rock. These shoots vary in length from 150' to 900'.

The district was organized about 1870 but it was not until 20 years later that any effective work was done there. An English syndicate

¹²Report IX, p. 226; X, p. 524; XI, p. 364; XII, p. 230; XIII, p. 320.

undertook extensive operations at the Black Hawk group, and they planned to build a 60-ton mill; however, the quantity of ore proved to be smaller than had been anticipated, and a small mill was erected, which was run only a short time.

There has been very little mining done in this district in the past 10 years and that, mostly by prospectors.

The Black Hawk Group, consisting of 23 claims, was first worked in 1890 by the English syndicate mentioned above. They drove 6 tunnels, varying from 40' to 100' in length, and numerous open cuts. A 10-stamp mill was erected and a pipe line laid at a cost of \$80,000, to bring water to the mill from a group of springs owned by the company 7 miles to the southwest. The mill was operated by steam power and wood was used for fuel. This was a heavy item of expense, wood costing, delivered at the mill, \$4.00 per cord. The company operated only a short time and the mill was removed. The property is now idle.

- Bibl.: Report IX, p. 226; X, p. 524; XI, p. 364; XII, p. 230; XIII, p. 320.

Holcomb Valley District.¹⁵

This district lies principally in T. 3 N., R. 1 and 2 E., S. B. M. It is bounded on the north by the Mojave Desert, east by the Black Hawk District, south by the Bear Valley District, and west by the San Bernardino range. The annals of San Bernardino County state that prospecting for gold began in this county as early as 1859, the miners meeting with good success. The first pay dirt in this valley was found by Jack Martin and W. F. Holcomb. The news caused a great rush, and in a short time a number of prospectors were at work panning dirt. In May, 1860, W. F. Holcomb and Ben Ware located the first claims in Holcomb Valley, 5 miles north of Bear Valley, and for two or three years these valleys formed an organized district. Men rushed in from all parts, settlements were formed, and stores, hotels, restaurants, etc., flourished. The diggings were shallow and easily worked; consequently, they were worked out in a few years. About 1870 a 40-stamp mill was erected at Gold Mountain, near Bear Valley, but soon after was destroyed by fire. This was followed by a 5-stamp mill near the site of the former mill, but it was never used and was finally removed. In 1876 a 10-stamp mill was built in Bear Valley, but this, too, proved to be a disastrous investment, in spite of the fact that "Lucky Baldwin" was one of the owners of the property. About 1887 an English company was formed by Alex. Del Mar. extensive plans were made and a large amount of money expended, but the difficulty of obtaining water and fuel proved to be too great a handicap. Today increased facilities for working have greatly improved the condition of this district. Most of the past failures were due to poor management, and some large enter-

¹⁵Report X, p. 523; XII, p. 233; XIII, p. 323.

prises now being inaugurated, if backed by ample capital under competent superintendence, ought to prove successful. At the present time little is being done in this valley.

The Holcomb Valley Company, Ltd.,¹⁴ of London, owned in Holcomb Valley a large tract of placer ground, which, after several unsuccessful attempts, they were sluicing in 1894, on quite an extensive scale, employing a steam shovel, a separating machine, and elevators, the latter being used to dispose of the coarser tailings. The gold-bearing material, as then described,¹⁵ was not "gravel" in the ordinary sense of the term, but angular, granitic detritus, containing very few washed or rounded stones. The material was mostly fine. Occasionally cobbles occurred, but these were exceptional. The gravel was overlain by 4' to 8' of light, loamy material, while the substratum contained more clay, and was also richer in gold. In 1894 active operations were going on. A ponderous steam shovel mounted on a flat car was moved forward and backward as required, on a track laid on a crib of timbers. The machine was advanced, from time to time, toward the bank of alluvium. At each load it took up about a cubic yard of gravel, and sometimes more, and dumped it into a hopper which, through a feeder, discharged into a revolving screen. This caused a separation of the coarse from the fine material. The coarse pebbles and cobbles passed through the screen cylinder and were taken up by the buckets of a conveyor, which delivered them to a belt conveyor, arranged so as to deposit the tailings on the bank of the cut 30 feet distant. The finer material passing the meshes of the screen dropped into a sluice box beneath, and was carried by a stream of water over riffles and blankets. The fine tailings were conducted through a half-round steel flume, at the foot of which they were shoveled out of the tail race by hand.

The capacity of the plant was from 1000 to 2000 yards per day, depending on the water supply, which, during 1894, was very low. The management felt considerable satisfaction at the operation of this plant, as it was the only means so far employed which promised success to the undertaking. Since which time the property has been idle.

Holcomb Valley Mining Company (placer). This company owned a tract of placer ground near the head of Upper Holcomb Valley. During June, 1894, a shaft was sunk and a large quantity of water was encountered, but it was hoped that by continued pumping bedrock could be reached.

It is said that a large amount of coarse gold has been taken from the upper part of the valley. Holcomb Valley Mining Company of Los Angeles, owner, J. Burnap of Los Angeles, superintendent.

¹⁴Report X, pp. 520-523.

¹⁵Report XII, p. 233.

Morongo District.¹⁶

This is a gold and silver district in the San Bernardino Mountain Range at an elevation varying from 5000 to 6000 feet. It is in T. 2 N., R. 5 and 6 E., S. B. M., and lies 46 miles north of Seven Palms Station, on the Southern Pacific Railroad. It is bounded on the northwest by the Black Hawk District; on the northeast by the desert; on the south by the watershed of the Whitewater River and on the west by the Oro Grande District. Water and timber are plentiful and a large amount of profitable work was formerly accomplished. Of late years interest in this region has declined, and but little work is now carried on.

The most extensively developed lode in this district is the Morongo King, which, together with the Overly Scott and the Glasgow, constituted the **Morongo King Group** of mines. These 3 claims are on one lode, having a general northeast and southwest strike, and dipping about 65°. The vein outcrops for several hundred feet. On the Morongo King a shaft was sunk to a depth of 180'. At 100' two drifts were run on the ledge for a distance of 30'. All these workings showed pockets of free-milling gold ore, of which between 80 and 90 tons were formerly on the dump. This ore carries a large percentage of sulphides. Eighty feet northeast of this shaft another was sunk 30' on the vein, which here shows a width of 4½'. Near the north end of the Overly Scott claim a 14-foot shaft shows a 7-foot vein of similar ore.

The **Nichols Mine** was opened by four shafts sunk on the vein, which was 12' wide, and contained high-grade ore. The shafts were 100', 70', 38' and 20' deep, respectively, and there seemed to be a good prospect of developing a valuable property.

Not far from the above mine was the **Rattlesnake** claim, on which a good deal of work was done, developing a fine body of ore that carried from 40 to 60 ounces of silver per ton, and a small amount of gold.

Five miles west of the Morongo King mines wood and water were to be had in fair supply. Antelope Springs, 1½ miles to the east, also afforded enough water for the use of the mill. On the **Capital**, **Scandalosa**, and **Monitor** claims, shafts were sunk varying from 10' to 50' in depth, each of which showed fair prospects in gold. There were several other lodes in this district which seemed to carry either gold or silver, and sometimes both, in paying quantities.

DESERT VEINS.**Arrowhead District.**

This district at the southwest end of the Providence Mountains adjoins the Trojan District on the south in T. 9 N., R. 13 and 14 E., S. B. M., and is 28 miles west from Fenner, on the Santa Fe Railway. From 1883 to 1887 considerable work was done in the district, several arrastras having been worked by Mexicans on the gold-bearing ores,

¹⁶Report VIII, p. 504; IX, p. 226; X, p. 526; XII, p. 234; XIII, p. 324.

which yielded from \$30.00 to \$50.00 per ton. The veins have a north and south trend, and can be traced for a considerable distance, the walls being granite and porphyry. For several years, until recently, the district has remained dormant, but a new era seems now at hand and it gives promise of heavy production. Several properties were recently being developed, the most important being the Hidden Hill, because of its previous large returns and the ore now blocked out ready for treatment.

Hidden Hill.¹⁷ This mine, which is on the east slope of Providence Mountains, 20 miles north from Fenner, was located in 1882 by Messrs. Thompson, Miller, West and Cook, and comprises three claims and a fraction, i. e., Hidden Hill, Bill McKinley, Golden Queen and Golden Queen Fraction, covering 70 acres. A company was formed and at present the officers are as follows: Frank Crawford, president; T. J. Murphy, treasurer; A. D. Nescus, general manager, with offices at Needles.

The most promising workings thus far are on the Golden Queen claim, the deposit being of quartz, carrying gold and copper.

At present all ore exceeding \$50.00 per ton in value is shipped to the smelter, but it is said that the company contemplates the erection of a concentrating and amalgamating plant to treat the lower grade ores.

The **Mable Group** is three miles north of the Hidden Hill Mine in the Providence Mountains. Development consists of two shafts, 140' and 65', respectively. In No. 1 shaft the vein is said to be 4 ft. wide, with pay streak 14" wide carrying values that run from \$120 to \$500 per ton. Considerable high-grade ore has already been shipped to the Needles smelter. Thomas A. Gaunon is the owner.

Dale Mining District.

Dale is near the south boundary of San Bernardino County, in T. 1 S., R. 12 E., S. B. M., about 45 miles south of Amboy, on the Santa Fe Railway, and 50 miles north of Mecca, a station on the Southern Pacific Railroad, 90 miles east of Banning.

The first locations in this district were made in the early '80s, and work has been carried on in a small way ever since until during the last 5 or 6 years more active and systematic work has been done.

There are many properties located all over this district, extending over a territory of some 8 or 10 square miles, but the main properties which are now being developed are confined to an area of about 4 square miles.

¹⁷Report XIII, p. 323.

The following are the principal properties :

Supply Group
O. K. Group
Brooklyn
Virginia Dale
Ivanhoe
Carlisle
Leota
Bon Ton
and others less known.

The **Supply Group** is at an elevation of 2,350 ft. and covers 530 acres. This property is the most important one of the district, and for many years was a regular producer, having yielded over \$250,000. The mine is opened by a 1100' shaft and over 5000' of underground workings. The shaft is equipped with a 50 h.p. Fairbanks-Morse hoist. The mine was operated for several years under lease and bond by the United Greenwater Copper Co., 30 Church St., New York, at which time about 80 men were employed. The ore was treated by dry crushing and direct cyanidation. Capacity of mill, 100 tons per 24 hours. Gas engine supplied the necessary power. Ceased operations in the winter of 1915 and the property is now idle. Owner, H. A. Landwehr, Union Oil Bldg., Los Angeles.

O. K. Group. This property, also owned by H. A. Landwehr, is now developed to a depth of some 800' with laterals and drifts of over 100'. Elevation 2350'. This mine has produced around \$200,000 in gold, and has a 10-stamp mill and cyanide plant of 50 tons capacity, modern in every way. The shaft is equipped with a 25 h.p. Fairbanks-Morse gasoline hoist. This property was also under lease to the United Greenwater Copper Company, but no development work is now being carried on. Water was pumped from a well at Dry Lake, which is close by.

Brooklyn. The Brooklyn Mining Company of Highland, Cal., owns the Brooklyn Group and the Los Angeles Group. The Brooklyn Group is developed to a depth of 650' or 700' and is a producer at the present time. This property is equipped with a Nissen stamp mill and cyanide plant and 8 or 10 men are continuously employed.

Virginia Dale Group.¹⁸ This important group of claims owned by the Sigafus Estate of Riverside, is developed to a depth of some 350'. Drifts and laterals are developed to a distance of some 500' or 600', and the mine is equipped with a Lane mill, built about 6 or 7 years ago. This mill was not operated to any great extent, only about 1000 to 1500 tons of ore having been treated. The veins are from a few inches to 2 feet in width. Active work was commenced on the group in the

¹⁸Report XIII, p. 314.

summer of 1896, at which time a 5-stamp mill was moved there from Twenty-nine Palms.

Ivanhoe. Developed to a depth of 250' or 300', and is also equipped with a mill and cyanide plant, but has not been operated beyond doing the assessment work during the last 4 or 5 years owing to the differences of opinion among the stockholders.

Carlisle. Opened up quite extensively and has changed hands within the last few months, and development work is carried on steadily and continuously. It is said considerable ore has been developed, and that the erection of reduction works is now contemplated.

Exchequer Mine. This property is owned by John McGrath and Al McRae, of San Bernardino, and comprises 100 acres. It is four miles south of Dale, at an elevation of 2000 ft., and the development work consists of three shafts, 110', 100' and 40', respectively, with a 50-foot drift in the 100-foot shaft. It is equipped with a roller mill made in San Bernardino, and 20 h.p. gasoline hoist. The property is now idle because of lack of water.

The **Other Properties** referred to have been developed in a small way to a depth of 100 feet or more; some drilling also has been done, but most of the work carried on has been the necessary yearly assessment work. The district as a whole has a promising future; it is well mineralized and the veins are easily traceable for some distance. While here and there rich bunches of ore have been encountered at various times and places, there is nothing to prove that it will make a high-grade camp. All indications point toward a medium grade ore averaging around \$10.00, with veins from $2\frac{1}{2}'$ to 5' wide, and amenable to treatment. Where amalgamation has been carried on, from 60% to 75% of the values have been saved on the plates. Amalgamation and cyanidation have saved from 90% to 97%.

The main drawbacks to operating in the district are that it is isolated and inaccessible from the railroad, and the cost of development work has increased considerably, owing to the expense of freighting, \$20.00 per ton freight from the railroad points being the usual charge.

Water supply has been also somewhat of a drawback, yet this is not now a serious hindrance, as ample water can be had in the district within a reasonable distance. The fact, however, that the mines are dry and the ground easily worked, and that timbering, while necessary, is not burdensome, is greatly in their favor. Heavy ground has been encountered in a few places, but not to an extent to warrant comment.

Since the cessation of work by the United Greenwater Copper Company in 1915, very little actual mining has been done in that district, other than yearly assessment work.

Goldstone District.

The Goldstone district lies 33 miles north of Barstow on the Mojave Desert at an altitude of 3500 ft. above sea level. This district comprises an area of approximately 8 miles by 4 miles, which lies in a general northwest and southeast direction. It is reached by automobile stage from Barstow over a fairly good desert road.

In the following description of the geology of the district, we have drawn freely from the report of A. E. Rau,¹⁹ who made a comprehensive study of this region.

The district is of sedimentary origin, the center of which lies in a basin, surrounded with low hills. It is in these low hills that the recent discoveries have been made. Originally the area was flat, the result of deposition from lakes and seas. In these depositions limestones, shales, etc., alternated. At the end of the Tertiary or beginning of the Quaternary age an upheaval, probably due to the intrusion of a great dyke, tilted these sediments to the dip they now have. (*See Plate I.*)

The stratifications have no tendency to bend to the horizontal and this main dyke along the axis is fairly vertical and shows continuity throughout.

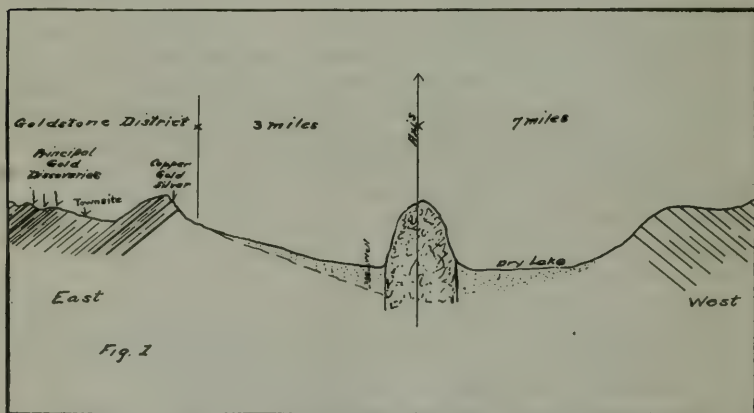


Plate I. Geological cross-section through Goldstone and country to eastward.
By courtesy of A. E. Rau.

The sediments have been intruded by a system of minor dykes which run through the country in a general northwest direction and lie parallel to the limestones, shales, etc. These minor dykes are dioritic and are probably due to the same or a slightly later eruptive period. They are partly metamorphosed and influenced the metamorphism of the sediments, mainly along the contacts, causing the impregnation of the sediments with quartz often at distances from the dykes. (*See*

¹⁹The Goldstone District, by A. E. Rau, Mining and Oil Bulletin, Chamber of Mines and Oil, Los Angeles, June, 1916.

Plate II.) The greater part of the mineralization is found in the quartz bodies contiguous to the dykes. Much of the vein filling resulting from this metamorphism is found in the limestones and is therefore irregular.

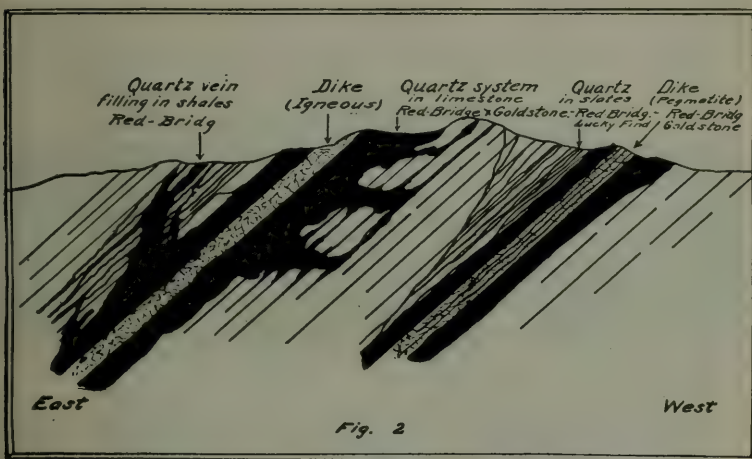


Plate II. Geological cross-section at Goldstone. By courtesy of A. E. Rau.

Many fine specimens of gold-bearing quartz have been found near the surface. These rich depositions are due to surface enrichment resulting from erosion, and redeposited near the surface. All of the valleys of this region are enriched with placer material. Besides the free gold, pyrite, galena, chalcopryrite, malachite, and argentite have been uncovered.

The original discovery was made in December, 1915, but no active work was undertaken until the following March. The district has now been practically covered with claims and considerable activity was manifested during the summer. The two companies described below control the greater part of the field and numerous lessees are working their claims.

Water is hauled to the camp from the Seeber well in the valley, 3 miles to the south, and sold at 1½¢ per gallon.

A boarding and lodging house have already been built, and the miner is charged \$1.00 daily for board. Miners' wages are \$4.00 per day, or \$3.00 per day and board.

A small quartz mill is now being erected at Seeber well by Mr. Bel-lander of Los Angeles, which will be operated as a custom mill. Expect to commence milling October 1, 1916.

Goldstone Mining Company has five groups of claims in this district and is sinking a 2-compartment shaft on the site of the original dis-

covery. Most of the work done so far has been open-cut work with the idea of locating the various veins. About 40 tons of ore averaging \$200 per ton were shipped during the early summer. There are a number

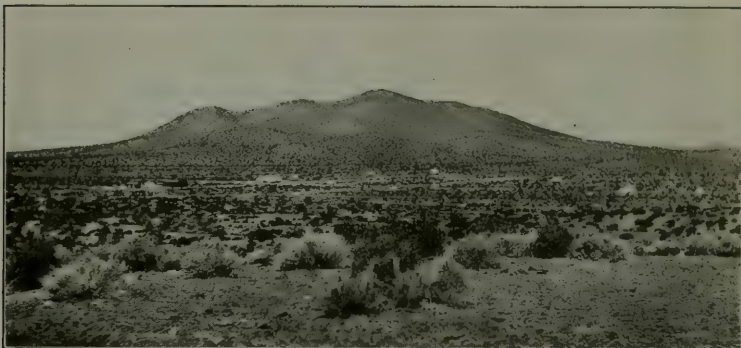


Photo No. 8. Camp of Goldstone, looking southwestward. Photo by Ralph Roseberry.

of lessees working on the different claims and considerable good ore has been uncovered. The company is drilling for water and hopes to develop it at a depth of a few hundred feet. Ore is now hauled by



Photo No. 9. Main shaft of Goldstone Mining Co. High grade ore sacked ready for shipment—in the left foreground.

motor truck to Barstow at a cost of \$6.00 per ton. It is expected to install machinery this fall and operate on a larger scale. Chapin C. Rumrill, president; G. M. Leonard, secretary; Albert C. Turner, con-

sulting engineer; main office, Springfield, Mass.; home office, Barstow, Cal.

Red Bridg Gold Mines Company owns 9 full claims and 3 fractions adjoining the property of the Goldstone Mining Company. This company has about 30 lessees on its property. Each lease consists of 200 ft.



Photo No. 10. Open cut work at original strike at Goldstone Mine. Shaft in background.

on the lode by the full width of the claim. The work so far done has been mostly open-cut and considerable high-grade ore had been sacked and ready for shipment at the time visited. They expect to start operations on company account during the late fall. W. B. Redfield, president and general manager; Thos. L. Henderson, secretary, Barstow, Cal.

Ivanpah District.²⁰

This district is 100 miles northeast from Daggett, and near the Nevada state line. It is in T. 17 N., R. 13 E., and about 80 miles north of Fenner, on the Santa Fe Railway. The silver-bearing lodes, though not large, are considered rich, several of them being well developed. Two small mills were at one time running. This was originally a silver camp, but later some gold prospects have opened. (*See under Silver.*)

²⁰Rept. IX, p. 238; X, p. 531; XIII, p. 324.

Mescal District.²¹

This is 9 miles northwest of Ivanpah and 90 miles north-northwest from Fenner, a station on the Santa Fe Railway. The veins, though not numerous, are of fair size, and carry a good grade of gold-bearing



Photo No. 11. High grade ore sacked for shipment at the Red-Bridge Mine.

quartz. The **Cambria Mine**, upon which most of the development work has been done, was opened by two tunnels run on the ledge 300' in length. A 10-stamp mill was operated on ore which yielded \$20.00 per ton in free gold, the bullion ranged from 938 to 990 fine.

Ord District.²²

This is bounded by a very irregular line, having T. 10 N., R. 2 E., near its center, the principal group of mines being 14 miles south of Daggett.

"It is an arid, timberless, and almost waterless area, its surface being divided between rugged mountains, sandy plains, and low-lying alkali flats. Although an old district, organized about 1870, Ord has not produced much bullion, only one small mill having been erected there, nor has the population ever been large. It contains many veins, on some of which a large amount of work has been done, the entire expenditure aggregating, it is said, \$40,000. The altitude of these mines averages about 4500 feet above the sea. They are in granite. Fourteen locations of 1500 feet each were made, nearly all the property of the Painsville Company, which obtained U. S. patents for most of them, and worked on them for several years. About one-half of these claims, at the northerly end of the series, carry some copper and silver as well as gold, the balance being strictly auriferous. For a short distance beneath the surface the ores were much decomposed and were free

²¹Rept. X, p. 532.

²²Rept. X, p. 528.

milling, the sulphides of iron and copper coming in at greater depths. The ore occurred in shoots, which, so far as explored, ranged from 200' to 400' in length.



Photo No. 12. Open cut mining at Red-Bridge property, showing face of metamorphosed sediments. Photo by Ralph Roseberry.

"The veins have a north and south strike, and dip easterly at an angle of 70° , the ore chimney pitching south. The principal mines were the Painsville and Rio Vista, on which several shafts were sunk and connected by drifts. Considerable work was done on the Last Chance, Central, Modesto, Josephine, and Coupon claims. On the latter was a vein 60' wide, as shown by cross-cutting. A number of shafts were sunk and a long tunnel driven, it being possible to obtain, by tunneling, backs of more than 800 feet. The great body of the ore developed in this district was of little value, as it carried an average of only \$8.00 per ton in gold, not enough, it was said, to pay the expense of working on the ground or of shipment. With improved facilities for either, it might become proportionately valuable, as it was said to exist in great quantities. A few small springs supply all the water to be had in the district.

"In the southwest part of this district, at a point 12 miles north from Babbitt Springs, a rich deposit of chloride or hornsilver, with some gold, was struck in the fall of 1889. Several small lots of this ore sent to Selby Smelting Works yielded large returns. As but little work was done on this vein, which was narrow and occurred in limestone, its actual or even prospective value was not determined. Much prospecting was induced by this strike, but did not result in any valuable discoveries. This claim was known as the Cox."

The following other properties were known in 1914:

Gold Peak Mine. This property, owned by J. C. Turner, of Victorville, is located 37 miles northeast of that town, at an elevation of 4000 feet. The deposit is a fissure vein in granite, on which a shaft 210 feet has been sunk, and several feet of drifting done. This mine has, it is said, produced \$40,000 to date, most of the ore having been treated in a custom mill 8 miles distant. This mill has lately been acquired by the owner of the Gold Peak mine.

The Gold Brick Mine, comprising 60 acres, is owned by George B. Parks and T. C. Nicklin of Barstow; the claims being known as Gold Brick, Gold Coin, and Golden Eagle. Most of the work has been done on the Golden Eagle, on which is a 100-foot shaft and 70 feet of drifting. The property is 20 miles south of Daggett, and 17 miles south of Barstow. The vein is of quartz in altered granite. It is 50 ft. wide with a 3-ft. pay streak, but is of too low grade to pay to work with the present equipment.

Osborn Group (see under Copper).

Oro Grande District.

This district, which was equally well known as the Silver Mountain Mining District, lies about the town of Oro Grande (Halleck post office) on the A. T. & S. F. Railway, and was formerly described, with respect to its limits, as follows:²³

Commencing at Stoddard's Crossing on the Mojave River; thence southwesterly to the Panamint Crossing on the Mojave River; thence due west to the county line between Los Angeles and San Bernardino counties; thence to the southeast corner of Kern County; thence to the place of beginning, covering in all about 20 townships, in the southwestern angle of San Bernardino County. It embraces all the mines for some miles around, though in fact each group of mines or hills has been given a separate name. However, as these so-called districts are mostly without organization all the claims and mines will be considered under one head.

Victorville and Oro Grande, stations on the A., T. & S. F. Railway, 6 miles apart, are distributing points from the railroad to all of the mines and to agricultural areas that are rapidly developing. It was in this district that the earliest discoveries were made in the western part of the Mojave Desert and for 10 years prior to 1890 much work was carried on. At one time this district was the largest and richest in the county, the chief products being gold, silver, marble and limestone. Besides these, paving blocks, cement and other building materials are produced today.

²³Report X, p. 527.

The geology of the district about Oro Grande²⁴ is complex, the formations being uptilted, greatly faulted, and broken, besides being intruded by dykes of felsitic rock, diorite, and quartz porphyry. The region may be described in the following general terms:

From the town of Oro Grande, which stands on the east bank of the Mojave River, the country rises eastward in a gentle slope for half a mile; thence gently rolling hills are reached, which in turn gives place to more rugged masses and finally to a rough mountainous area, the hillsides being almost precipitous. The low-lying country about the base of the hills is made up mostly of schistose micaceous rocks, quartzose mica schist predominating. The first hills of any size are eruptive, mostly of light greenish felsite and a coarse grained porphyritic rock. Beyond are prominent hills of dense, hard quartzite resting upon crystalline limestone, the highest hills being made up of practically the same materials (quartzite and limestone), in part schistose, with some mica schist, and many intrusive dykes of all the previously mentioned eruptives, prominent among them being a dark green diorite.

In 1880 when a big boom was at its height the Oro Grande Mining & Milling Company erected a 10-stamp mill to work the local ores. Many locations were made and recorded and considerable work was done.

In 1890 the Embury and Carbonate mines (silver) were opened and created considerable excitement, and in the later '90's a 10-stamp mill was erected at Victorville to treat the ores from the various mines. Following this, several mills were erected, and a smelter was built and the district flourished for a long time.

Carbonate Mine.²⁵ The principal mine of this district and the one which gave the camp its fame is the Carbonate mine, $1\frac{1}{2}$ miles east of Oro Grande, at 3000 feet elevation. It was discovered by a man named Collins, who was working in a lime quarry nearby. Collins found croppings of ore—limonite and manganese—containing silver. He developed the property somewhat, but it finally passed into the hands of a Los Angeles company which opened the mine quite extensively.

The limestone and schist which enclosed the vein have a general trend northeast and southwest, the dip of the main workings being not over 20°. Here an incline shaft was sunk 225 feet on the vein. At the bottom, the shaft has a vertical depth of about 100 feet. Two veins of ore, consisting principally of siliceous and earthy oxide and black oxide of manganese with carbonate of lime, sometimes crystallized, were followed from the surface to the bottom of the incline. These

²⁴Report XI, p. 360.

²⁵See Report IX, pp. 230-233; X, p. 527; XI, pp. 361-362; XII, p. 263; XIII, pp. 33, 320, 607.

veins were very irregular in width, varying from a mere seam to upwards of 2 feet in places and averaging 1 foot.

The values lay chiefly in the lead carbonate and silver which accompanied the gangue minerals. The two veins were at the contact between massive blue limestone and mica schist. The latter is from 1' to 4' in width, the ore lying both above and below it, the whole being inclosed between hanging and footwalls of crystalline limestone. At various points in the workings was a light-colored, much decomposed rock, resembling felsite, which appeared to have been injected between the strata in a thin sheet. It was notable that where the buff-colored, granular rock occurred in contact with the vein an enrichment of the ore was noticeable, and its absence was marked by a low value of the ore, or no ore at all. In the incline at a depth of 40 feet, a short drift was run in on ore of good grade. At 180 feet from the collar of the shaft a discovery was made that caused this mine, and in fact the entire camp, to become a scene of great excitement.

At this place a small wedge of crystalline, granular quartz and calcite appeared, and with it, flakes of free gold. Just below the point of this discovery the wedge widened to several inches, and the rock was a mass of glittering sheets and shot-like pieces of gold. Assays of the material, it is said, gave fabulous returns. The ore was broken down on canvas, and every ounce of it sacked on the spot. It was followed down some distance but gradually thinned out below the 200-foot level, where the drifts were run, one 50' northeast, the other 40' southwest. From these drifts considerable rich quartz was obtained.

This mine subsequently produced considerable high-grade ore, but the work of late has been by "chloriders" and the mine is now in poor shape for working on a large scale.

The Embody Mine was described, in substance, as follows by Mr. W. H. Storms:²⁶

Within half a mile of Oro Grande and on a lower spur or ridge that makes down from the hills is the Embody mine, which, during the excitement at this locality in 1890, attracted considerable attention. The gold-bearing material is a friable quartzose, micaceous rock, and the deposit has the appearance of an impregnation without definite form.

The shoot of gold-bearing ore makes across the strike of the schist, and thus the deposit differs from those of the Homestake in the Black Hills of South Dakota, where micaceous schists have been silicified and hornblende schists metamorphosed to chloritic schists, the whole carrying gold across a broad zone 1600 feet in width and 6000 feet in length. Here gold occurs in shoots or veinlike zones, without definite limits of any character. Further, too little development has been done to permit

²⁶Report XI, p. 361.

of positive prediction as to the future of this mine. The formation strikes northeast, and dips 70° SE.

The country is somewhat broken up, but no considerable masses of shattered rock were observed. The croppings are quite heavily stained with red and brown iron oxides, and this evidence of mineralization can be traced for some distance. Two shafts, one nearly 100' deep, the other about 30', were sunk on the deposit, exposing rock of uniform character, all carrying some gold. The width of the gold-bearing zone was undetermined, but was estimated to be from 6' to 20'.

As far as learned a "mill run" had never been made on the rock from this mine. Mining operations had been stopped and, in 1889, the property was involved in some sort of dispute. The value of the rock was stated at \$8.00 to \$10.00 per ton.

The **Evan Davis Group** consists of 80 acres and is 50 miles east of Victorville at an elevation of 5000 feet, the several claims being known as the Valley View, Hidden Treasure, Ben Hur and Acme, on which some development work has been done. This mine is owned by Glenn A. Davis, who has milled considerable ore (amount not recorded) with an arrastra. The country rock is porphyritic granite, but the deposit is gold in diorite.



Photo No. 13. Mill and headframe at shaft of the Ozark Mine.

Ozark Mine is 9 miles by auto road northeast of Victorville and consists of 5 claims. The original location was made 25 years ago, but very little work was done up to the time of its acquisition by the present owner in 1913. Gold occurs in quartz porphyry along a contact

of rhyolite and diorite. The ore body strikes east and west and dips almost vertically to the south. It averages 115' in width and is said to assay \$6.00 per ton, with 65% of the value free milling—the remainder being in sulphides. This ore body is being developed by a 2-compartment vertical shaft, now down about 100 ft. Some drifting has been done on the 50-ft. level to determine the width of the ore body. The present work, however, is being done on a 6" quartz stringer which outcrops about 1000 ft. south of the main contact deposit. A 110' shaft has been sunk on this stringer and drifting is now being done along the vein at the 90' level. The ore is said to average \$50 to \$60 per ton. It is reduced in a 10-stamp mill. The mine equipment consists of a 25-h. p. Fairbanks-Morse compressor, machine drills, blacksmith shop, etc. The mill is equipped with a rock crusher, ten 850-lb. stamps and two Standard concentration tables operated by a 50 h. p. Fairbanks-Morse gas engine. Expect to develop sufficient water in the shaft for working purposes. The work thus far has been entirely development and only a few test runs have been made at the mill. Company is incorporated for 1,000,000 shares of par value of \$1.00, and hope to raise sufficient funds to sink the main working shaft to the 150-foot level. Six men are employed. Owner, Ozark Mining & Milling Co., 522 H. W. Hellman Bldg., Los Angeles. J. S. Garrison, general manager, Victorville, Cal.

Yankee Maid Mining and Milling Co. This property is held by L. C. King and William Greenhouse, both of Victorville. It is about 8 miles northeast of Oro Grande, at an elevation of 4,000 feet. The claims are the Yankee Maid; High Park; Stoneham No. 1, Stoneham No. 2, and Little Gladys, comprising in all 120 acres. The country rock is granite and the deposit is gold in granite and porphyry. The underground work thus far consists of two shafts, 140' and 100' respectively, ore from which is now being milled. The owners have purchased a mill on the Mojave River in the town of Victorville, formerly owned by Charles E. Jones of Anaheim, which is equipped with 5-stamps and a 50-ton cyanide plant. They are now repairing the mill and developing the mine preparatory to a steady run.

Oro Grande Mine.²⁷ This is in the mountain of the same name, and in Silver Mountain District at an elevation of 3750 feet. The gangue is laminated quartz, with a clay gouge on both walls which are porphyry and granite.

A well-timbered shaft, 6'x9' and 250' deep has developed the mine to that extent. There is also another shaft, No. 2, 100' from the first, which was sunk 50' and showed 2' of quartz. The quartz in this mine carries pyrites and is reported to yield \$12.00 per ton in free gold.

²⁷Report IX, p. 227.

The remoteness of the Oro Grande property from water, however, and the cost of transportation, compelled the company to stop work, notwithstanding that it owned a good 10-stamp mill in connection with the mine.

Oro Fino Mine.²⁸ This property is in Silver Mountain District, 10 miles from Oro Grande, at an elevation of 3790 feet. The vein strikes east and west, and the country rock is feldspathic granite. The lode is from 6" to 20" wide, and carries high-grade gold rock. The mine is at present idle.

Four Brothers Mine (formerly Whatnot Mine). This is on Whatnot Hill, in the Oro Grange Range and in Silver Mountain District, 3½ miles east of the Mojave River. The vein strikes north and south with a width of from 10" to 12"; the gangue is quartz. It is developed by a tunnel 300' long on the vein, with shafts to the surface, and some winzes and crosscuts. The vein was found to be spotted with occasional rich ore, the assays in 1889 being \$60.00 in gold, and \$20.00 in silver per ton. Diorite forms both foot and hanging walls. The mine has recently been reopened and is now being worked by Scheerer Bros. (Jos. Scheerer et al., Victorville), the present owners. Water is obtained by pumping from the incline shaft of the Scheerer Gold mine (formerly Black Diamond), one mile east of the Whatnot. Three other claims adjoining on the south are also being developed for tungsten.

Steadman District.

The only producing mines of this district are the old **Bagdad, Chase and Roosevelt Consolidated**, now owned and operated by the **Pacific Mines Corporation**. See under Copper, page 16.

Twenty-nine Palms District.²⁹

This adjoins the Morongo District on the east, includes the greater portion of T. 1, 2 and 3 N., R. 8, 9, and 10 E., being near the vague and not well-defined boundary between the Mojave and the Colorado Deserts. There are many metalliferous lodes in this district, most of them gold-bearing. They are rather narrow, ranging from one to three feet in width. While many of these lodes have been prospected, but little deep work has been done. Some of the ore worked years ago by arrastras yielded as high as \$100 per ton, and nearly all of that worked by the two small mills in the district has been of high grade.

This district being well out in the desert, neither wood nor water is in large supply. There are, however, several large springs in the vicinity. From one of these issues a stream sufficiently strong to flow for three miles before it disappears in the sand. Most of this flow could be dammed and stored, there being near the spring a suitable site for a reservoir.

²⁸Report IX, p. 228.

²⁹Report X, p. 526.

Although mineral-bearing lodes are known to exist east of this locality, no mining districts have as yet been organized in that region.

Vanderbilt District.³⁰

This district is situated among the hills which form the northeastern end of the New York Mountains. It is reached by the Ivanpah branch of the Santa Fe Railway. The geology of the district is simple. The rocks of the region are chiefly gneissoid and schistose, granitic and hornblende rocks, intruded by pegmatitic dikes. The strike of the country rocks, over an area of 20 square miles of this region, is almost uniformly north and south, the dip varying, but usually nearly perpendicular. The eastern borders appear to become more gneissoid, and contain more hornblende than the section immediately about the village, and west-erly is found a belt of limestone, beyond which occurs granite of normal type. Large dikes of rhyolite and vitrophyre occur in these western granites, and ferruginous quartz veins which contain some gold, but are usually low grade and not of a character to attract much attention.

The veins are grouped in systems and have direct relations, and are due to common causes, viz: the fissuring of the rocks; the injection of dikes along many of the planes of weakness thus formed, a subsequent movement of the rocks, and later, the deposition of ores in those fissures.

Very little work is being done in the district and the following are the only companies operating:

J. Z. Barnett Mining Company, Adolph Johnson, president; H. H. Hodge, secretary; own 8 claims in the New York Mountains, 12 miles northeast of Lanfair at an elevation of 5500 feet. Development consists of 3 shafts and a couple of thousand feet of underground workings. The main working shaft is 300 feet deep and is equipped with a 15 h.p. Fairbanks-Morse gas engine hoist. The ore is shipped to the Selby smelter. Three men are employed.

The Vanderbilt Development Company, No. 301 Storey Building, Los Angeles, is working a property in this district, and made shipments of high-grade ore during 1915.

Other Districts.

There are numerous prospects and some few mines scattered over the desert in other localities than those specifically described above. The following is a list of those properties which actually produced gold during 1915:

- Bagdad-Chase Gold Mining Co., Barstow;
- Big Four Mining Company, Needles;
- Emperor mine, Kunze and Conway, Needles, owner;
- Horn Mine, J. E. Kelton of Blythe Junction, owner;
- Pioneer Mine, in Providence Mountains, J. F. Marrs, owner;
- Piute Mine, F. A. Crampton, Cima, owner;
- Riggs Mining Company, Frank Riggs of Silver Lake, owner;
- Sunnyside Group, Vidal district, Clyde Stewart of Parker, Arizona, owner.

³⁰Reports XI, pp. 367-368; XII, pp. 235-237; XIII, p. 329.

Desert Placers.

Numerous areas of placer gravel are known to exist on the Mojave Desert, but only one area has been thus far profitably mined. This district lies 15 miles due north of Barstow at an elevation of 3500 feet above sea level. The placers are deposited in a broad desert valley and were evidently washed down during heavy floods from the granitic ranges to the north.

Cool Gardie Placer Mine is in Sec. 29, T. 32 S., R. 46 E., M.D.M., and has been worked spasmodically since 1900. This property is reached by a good desert road (Goldstone road) from Barstow. It consists of 9 claims totaling 1500 acres. A battery of dry washers and concentrators (especially designed and patented by the mine owners) are used to extract the gold, as there is not sufficient water present for operating a wet-concentration mill. Two 50 h.p. gas engines supply power for the mill. This property is said to have produced over \$100,000 to date. Owner, Cool Gardie Mining Co., 15 Broad St., New York; Henry Mountain, president.

IRON.

The existence of large iron ore deposits in the desert regions of San Bernardino County has long been known; however, none of the deposits have as yet been worked commercially. Quoting from a report³¹ by C. Colcock Jones—"This condition is not due to a lack of all the essential materials and factors for success in iron and steel smelting, but is rather due largely to the general fact that it is only within a comparatively few years that the centers of population on the Pacific Coast have attained a size that would entitle them to the position of distributing or freight centers, or that the back-country has been enough built up to make it sufficiently interesting to the railroads to foster trade from the local centers to the interior points rather than seek to supply such local centers to the interior by a transcontinental haul."

Mr. Jones estimates that there are 20,000,000 tons of available, high-grade ore and double that amount of probable ore in Riverside and San Bernardino counties.

The principal deposits of San Bernardino County are: Cave Cañon Group, north of Baxter; Iron Age, 6 miles east of Dale; Iron Mountain Group, 10 miles west of Silver Lake; and the Vulean Group, in the Providence Mountains, 4 miles east of Kelso. Less important deposits occur in the Kingston Mountains, north of Amboy, south of Blythe Junction, and in the Lava Beds district south of Daggett.

The iron ore deposits of San Bernardino County will eventually become of importance both on account of the exhaustion of high-grade

³¹"The Iron Ores of California and Possibilities of Smelting." Bulletin of the A. I. M. E., Sept., 1915.

ores in the eastern section of the country, and because of the necessity for supplying the growing demands of the Pacific Coast more cheaply than is done at present. An important factor in the development of these deposits would be the utilization of California oil in smelting iron ores. The use of hydro-electric power, for which there are large available resources in the southern Sierra Nevada Mountains, would also be of great importance in the development of these districts.

The Cave Cañon Group (of the Iron Chief Mining Co.) is in Secs. 12 and 13, T. 11 N., R. 7 E., S.B.M. Of this deposit Mr. C. K. Leith³² writes as follows:

"The Cave Cañon iron area which contains the Cave Cañon mines, is about $\frac{1}{4}$ mile north of Scott station³³ on the Salt Lake Railroad. It lies on the south side of the hills, between a complex of acid and intermediate rocks on the north and coarsely crystalline marble on the south, dipping southward at about 30°. The iron ore is mainly along the contact, but apparently projects into the igneous complex below and into the marble above. Little patches of marble were seen in what was taken to be iron ore. The exposure is much broken and covered by desert varnish, with the result that the surface distribution is not at once obvious. While the iron-ore debris covers the slope, in several places the igneous rocks project through it. The ore occurs in two belts, one along the trend of the other, but separated by an erosion valley. The western belt is about 2000 feet long and the eastern 1700 feet long. The width of outcrop reaches a maximum of 450 feet. Its average width for the western belt may be 300 feet and for the eastern belt 100 feet. The true thickness of the ore body, assuming that it follows approximately the contact of the limestone, is probably less than half the width of outcrop because of the southward dip of the formation and the fact that the erosion slope follows the dip. Four tunnels are reported on the property. Two were seen in ore, the longer one 30 feet in length. The ore is mainly red hematite and limonite, soft and broken, showing limestone bedding. In one of the western tunnels green iron silicates were observed in the ore. Commercial analysis from two sources show a percentage of iron above 60% and phosphorous within the Bessemer limit." This group is patented and no work is at present being done to develop the property. Owner, E. H. Harriman Estate.

Bibl.: Bull. 38, p. 299.

Iron Age Mine, consisting of three patented claims, is in Sec. 29, T. 1 S., R. 13 E., S. B. M., 6 miles east of Dale, and about 45 miles by road south of Amboy, a station on the Santa Fe Railway. Quoting from the report by E. C. Harder and J. L. Rich:^{33a}

³²U. S. G. S., Bulletin 285, p. 198.

³³Now called Baxter. See map on p. 99.

^{33a}The Iron Age Iron-ore Deposit, U. S. G. S. Bull. 430.

"The mountain range in which the iron ores are located consists of intrusive diorite, granitic, and syenitic rocks of varying texture—granitic, porphyritic, and aphanitic. In the southern part of the Pinto Mountains metamorphosed sediments are associated with these rocks, but elsewhere no sediments occur.

* * * * *

"The Iron Age iron ores are largely hematite altered from magnetite, in the form of veins cutting intrusive granite and granite porphyry. Metamorphic minerals, chiefly garnet and epidote, are locally associated with the ore and country rocks. The principal iron-ore veins occur over an area about half a mile square, the larger ones on account of their resistant nature, forming the summit of a large hill. Several small veins occur in the area between the Iron Age deposit and Dale. The ores are very pure and of high grade, but the veins are not of sufficient extent to make the deposit very attractive commercially." Owner, A. R. Rhea of Los Angeles.

Bibl.: Bull. 38, p. 299; U. S. G. S., Bull. 430, pp. 228-239.

Iron Mountain. This locality is described as follows by J. H. Crossman:³⁴

"Magnetic iron and hematite are found in the Lava Bed Mining District, Secs. 27 and 28, T. 6 N., R. 4 E., S. B. M. Two massive veins occur in this district on the southerly slope of the range of mountains, which is a southeasterly prolongation of the Ord Range. The latter is about 30 miles long from its extreme southeasterly point to its northwesterly extremity.

"The ridge known as Iron Mountain, where these immense deposits lie, is about 18 miles southeast, from Newberry Station, on the Santa Fe Railway.

"The Lava Bed Range of mountains is entered on its northerly border through a narrow gorge. The rocks in both walls of this cañon are jagged, angular, and black, and stained by oxide of iron. At the entrance this defile is 50 feet wide by 200 feet in height, the walls being vertical in places; in others, slightly inclined. Passing in for 400 feet, an amphitheater is reached. This space is surrounded by rock of the same character as that in the walls of the pass or gorge. Thence, southerly for 5 miles, volcanic rocks, tuff and sandstones of volcanic material are found. Reaching the summit at an elevation of 3880 feet all traces of volcanic action have disappeared.

"The rocks are granitic in character on the southerly slope of the mountain, and at its base. At an elevation of 3025 feet is found the iron deposit under consideration, 8 miles from the summit. The mines are named: Dick Turpin, Nos. 1 and 2; Tip Top, Nos. 1 and 2; and Bessemer, No. 1.

³⁴Report IX, p. 235.

"These veins are well defined, with dissimilar walls and with a selvage or, as more commonly called, a clay gouge. They strike N. 20° E. and dip into the hill northwest at an angle of about 30°.

"The Tip Top and Dick Turpin are separated by 150 feet of syenite, and lie nearly parallel, continuing in their southerly course at a small angle of inclination. The Turpin ores are remarkably pure and highly magnetic. The Tip Top is the northerly vein, and lies at an elevation of 3205 feet. The vein is composed of hematite and magnetic iron, with a gray soft material known as nut ore. It strikes N. 70° W. Its northern wall is an irregular belt of dolomitic limestone; the southern, syenite. At this point the vein is 30 feet wide, increasing to 150 feet as the hill is descended 400 feet. The ore occurs as a well-defined vein in places, not in beds, as usual. The dolomitic formation that bounds the Tip Top on the north is irregular in form and strike and is, in turn, bounded by the granitic rocks, a prolongation of the Ord Mountain Range.

"The strike of the Bessemer No. 1 is due north and south, and this deposit also shows a strong body of magnetic ore reported free from phosphorus and sulphur. This mine has been but little developed, including some small pits and a 10-foot shaft. The ore body is traceable from its northeasterly exposure at an elevation of 3350 feet, in a southwesterly direction through the low foothills at an elevation of 3025 feet, for a distance, on the line of strike, of 3200 feet, with an average width of 80 feet, increasing in places to 400 feet." The present owners are Mrs. Phoebe Owens, San Francisco, and E. S. Lake, Los Angeles.

"Four miles southeasterly from this point, and on the same mountain range, occurs an extensive body of highly magnetic iron ore, the maximum width of which is 100 feet, the minimum 20 feet. The strike of the vein is the same as above."

Iron Mountain Group is in Sees. 11, 12, 13 and 14, T. 15 N., R. 6 E., S. B. M., about 10 miles west of Silver Lake. It has been estimated that this deposit contains 12,000,000 tons of good iron ore. There has been no development and the property is idle. Owner, Colorado Fuel and Iron Company, Denver, Colorado.

Bibl.: Bull. 38, p. 299; Bull. of A. I. M. E., Sept., 1915, p. 1889.

Vulcan Group is in the Providence Mountains 4 miles east of Kelso, a station on the Salt Lake Route in the southeast corner of T. 10 N., R. 13 E. It covers 260 acres. The ore, accompanied by vein filling, is a semi-hard red hematite and is a replacement of limestone near its contact with an igneous rock, monzonite. The largest lens has been estimated to measure 775' x 350', with a vertical exposure of 260', making it a quarry proposition. The average analysis of the Providence Mountain iron ore is given by C. Colcock Jones³⁵ as follows: Iron,

³⁵"The Pacific Coast Iron Situation," Bull. of A. I. M. E., Sept., 1915, p. 1889.

64.82%; phosphorus, 0.044%; silica, 3.04%; manganese, 0.278%; alumina, 0.568%; magnesia, 0.201%; lime, 0.444%; sulphur, 0.059%; volatile, 1.85%.

The work done has been confined to exposing the formation and besides several shallow workings, there is a 100-foot tunnel with numerous crosscuts. A full description of this deposit, to which the reader is referred, is given by the owner, C. Colcock Jones of Los Angeles, in the Engineering and Mining Journal of April 17, 1909, entitled: "An Iron Deposit in the California Desert Region."

LEAD—ZINC.

(See also under Silver.)

Ibex Mine (lead, silver, zinc) is in the Black Mountains, 16 miles southwest of Zabriskie and 6 miles north of Saratoga Springs. Elevation 1300 feet. Although this property is recorded in Inyo County, it is actually located in San Bernardino County.



Photo No. 14. Mine dumps and compressor plant at the Ibex Mine, 15 miles southwest of Zabriskie, in the Black Mountains, San Bernardino County. Photo by C. A. Waring, March, 1916.

The deposit is a vein averaging 3' to 5' in width in dolomite. Strike N.-S., dip E. The vein can be traced on the surface along its strike for 1800 feet. The ore is argentiferous galena with carbonates of lead and zinc. Occasional bodies of anglesite and linarite are associated with the galena. Shipping ore is said to have averaged 44% lead, 33% zinc, 16 oz. silver, \$16.00 gold. Development consists of 4 tunnels (see Photo No. 14), the longest being in 100' on the vein. Mining is at present

confined to gouging out rich ore bodies near the surface. There are 19 men employed at \$4.00 per shift. Ore is sacked at the tunnels and packed on burros down to base of hill to a 4-ton Kelly quad motor truck which hauls it to Zabriskie. Shipping (March, 1916) from 7 to 8 tons daily. Located September, 1914. Worked since January, 1916, by Ibex Spring Mining Co., S. F. Brock, manager. Property recently reported purchased by the Goodsprings Mining Co. of Nevada.

Hooper and Goselon of Victorville are working a zinc prospect 8 miles west of Victorville and claim to have encountered some high grade ore.

D. R. Oliver of Oro Grande made a shipment of zinc ore to an eastern smelter in 1915.

MANGANESE.

Very few deposits of manganese of any commercial importance are known in San Bernardino County. Only one up to the time of this writing has actually produced, namely the Owl Hole Manganese mine, described below, which was first opened last winter (1915), due to the enormous increase in the price of that metal.

Numerous low grade deposits are reported through the desert region, but in general the percentage of silica contained is too high to make them at present of commercial value.

I. D. Garringer et al., of Daggett, Cal., own a deposit of manganese in the Lava Mountains 5 miles by road northwest of Ludlow. The ore is said to average 40% manganese. As it is a recent location very little development work has been done. Owners expect to mine the deposit in the near future.



Photo No. 15. Owl Hole Manganese Mine, one mile northwest of Owl Hole Spring, Owl Mountains. Photo by C. A. Waring, March, 1916.

Owl Hole Manganese Mine: northwest of Owl Hole Spring, Owl Mountains and southwest of Death Valley Narrows. There are lenses of manganese ore on granite overlain by granitic conglomerate. The lens pictured (see Photo 15) is 75' thick and 100' long. First class ore as shipped carries 75% MnO_2 and less than 1% Fe_2O_3 . Second class ore carries about 55% MnO_2 . At the time the mine was visited the ore sold for from \$30.00 to \$50.00 per ton. The ore was hauled 35 miles to Riggs station in two 6-ton wagons drawn by a Model 18 Yuba Ball Tread Tractor. The trip one way took 16 hours and on an average of three trips per week were made. The contract price for hauling was 35 cents per ton-mile. Owned by Alex. Yeoman of Silver Lake.

SILVER.

In the year 1881 important discoveries of silver ores were made in the desert regions of San Bernardino County. From that time to date \$13,892,703 has been produced. The most important silver districts were the Calico, Ivanpah, Providence, and Silver Reef districts. Mining in these districts was most active during the eighties and early nineties. Most of the old mines ceased operations when the price of silver dropped below \$1.00 and since that time they have only been worked spasmodically by "chloriders." Many of these properties are still accessible and with new capital and skilled management might again become profitable.

Calico District.

By far the largest production of silver in San Bernardino County was derived from the Calico district now practically dormant. This district is seven miles north of Daggett on the Santa Fe Railroad and embraces the southern slope of the Calico Mountains.

The following description of the geology and ore deposits is quoted from a report of Waldemar Lindgren.³⁶

"Between the Mojave Valley and the next depression northward there is a mountain complex of about 2000 feet elevation above the plain, or 4000 feet above the sea level. The mining district of Calico lies on the southern slope of this complex. The Land Office maps place Calico in Sec. 22, T. 10 N., R. 1 E., S.B.M.

"Geology.—Going from Cajon Pass northeast towards Calico, along the Mojave River, the nearly horizontal, presumably Tertiary, sandstones of the desert are for a long distance the most prominent geologic feature; in places granite, metamorphic slates and limestone masses are exposed. Finally, at Barstow station, almost in line with the great eastern fault of the Sierra, liparite and other Tertiary eruptives are met with and from here on towards the Providence Mountains near the Colorado River they are very conspicuous. These eruptions are doubtless younger than the Tertiary sandstones of the desert. The form of

³⁶"The Silver Mines of Calico," Trans. Am. Inst. Min. Engrs. Vol. XV, p. 718.

the mountains, the oft-occurring craters, and finally the great masses of tuffs, give evidence in favor of their comparatively recent origin.

"The wide, nearly level Mojave Valley south of Calico is covered with Quaternary detritus, or shallow, dry lake-beds, smooth and hard as a floor. The complex north of the valley is predominantly composed of highly-disturbed masses of liparite and tuffs, together with clay and sand strata, derived from the former.

"Assuming Clarence King's determination of the age of liparites of the Great Basin to apply to this region—a very probable supposition—they should be regarded as early as Pliocene; the tuffs and sandstones would be referred to the Pliocene, and be parallel to the Shoshone Lake deposits of King.

"The sandstone and clay strata—the former loose and friable, the latter soft and greenish—form a zone along the foothills about $\frac{1}{4}$ to $\frac{1}{2}$ mile wide. The strike of the strata is nearly east and west at Calico, but changes gradually to northwest and southeast towards the northwest, following the trend of the foothills; to the east of Calico they bend more northeast and southwest. Near the desert the strata are inclined at very steep angles, and often crumpled and folded in an extraordinary degree; but, going northward, they soon become regular, dipping uniformly south at an angle from 40° to 25° . At some places in Wall Street Cañon they contain pebbles of liparite besides those of quartzite and granitic rocks.

"Most of the ore deposits occur in liparite or in its tuffs, as veins along fractures and dislocations of a more or less regular character; as simple, once open and subsequently filled fissure veins; as impregnations along complex fissure-systems, or filling and cementing more or less extensively, fractured zones. The gangue is predominantly barite with jasper; the present ores are haloid salts of silver, hydrosilicate, and carbonate of copper, resulting from primary rich silver sulphides and copper pyrites. Another class, closely connected with the former, occur as irregular surface-deposits in tuff or (rarely) in liparite, in the former case often approximately following planes of bedding."

The most important mine of this district and the only one at which any work was being done when visited is the Silver King mine.

Bibl.: Reports VIII, pp. 491-498; X, p. 530; XI, pp. 337-345; XII, p. 376; XIII, pp. 606-609.

The Daggett Reduction Company, General Office, Springfield, Mass., W. P. Hubbard, president, Phil. M. Chandler, secretary, is constructing a 200-ton cyanide plant below the old Silver King mine, 5 miles north of Daggett. This plant is to treat the tailing dumps of the old silver mines which, it has been estimated, contain about 150,000 tons that is said will average \$3.00 per ton.

The treatment will be briefly stated as follows: the material will be sluiced down to the plant and passed through a classifier; that which is already fine enough so as to held in suspension (150-200 mesh) will go



Photo No. 16. Old camp of Calico, looking south from Calico Mountains, Dry Lake in middle distance.

directly to the cyanide tanks, and the over size to a tube-mill where it will be reground to the required fineness. Mechanical agitation is to be used in a series of 10 wooden tanks. The solution used will be 1%



Photo No. 17. Cyanide plant of the Daggett Reduction Co. in process of construction, five miles north of Calico.

KCN. The process is a continuous one of agitation and decantation evolved by the superintendent, Mr. Millett—the solution being fed from the bottom and the clear pregnant solution decanted from the top. No filter is required. Zinc boxes are to be used for precipitating the silver. Two Diesel-type engines of 100 h.p. and 50 h.p. respectively,

built by the Chicago Pneumatic Tool Co., have been installed to supply the necessary power. Water is obtained from a well sunk by the old Silver King Company. Expect to start operations in September, 1916. The company later plans to construct a 5-stamp mill for treating custom ores, from the Goldstone district, 35 miles due north.



Photo No. 18. Mill of the Olivier-Funk-Osborn Co. south of Calico.

Olivier-Funk-Osborn Co. have a lease on the Silver King mine and are "chloriding" in the old workings. No new development work has been undertaken. The ore is hauled by team 2 miles to their mill situated in the flat below the mines, 5 miles north of Daggett. This company has been operating for the past two years and during the early spring installed a Straub mill of supposedly 12 tons capacity to replace the old 5-stamp battery which was formerly used. The ore is crushed to 40-mesh and treated by the old amalgamation pan process. Steam power is used, the fuel being crude oil. The ore is said to average from 15 to 20 ounces silver per ton. Five men are employed at the mine, and four at the mill. W. H. Olivier of Daggett is superintendent.

Ivanpah District.

This lies about 20 miles northwest of South Ivanpah, the terminus of a branch line of the Santa Fe from Goffs, and embraces the northward extension of the Clark Mountains. The silver-bearing lodes, though not large, are considered rich, and several of them were well developed. This district produced a few large mines, all of which are now idle. Among the most important producers were the following: Allie and Beatrice; Bob Lee and Hattie; Coliseum; Lizzie Bullock; and the Stonewall mines.

Providence District.

This district, formerly known as the Trojan district, is situated in the Providence Mountains, about 25 miles west of Fenner, a station on the Santa Fe Railway. These mountains extend for 80 miles from southwest to northeast and at Mount Edgar reach an altitude of 6400 feet. In these mountains a very rich body of silver ore was uncovered and worked for years. The principal mine here was the Bonanza King, located in the early '70s. Development work was continued and in 1880 a 10-stamp dry crushing mill was erected by the Bonanza Consolidated Company, which, it is said, made a record run in 1881, showing a clean-up of \$251,500 in 115 days and in 1884 showed returns of nearly \$1,000,000 in 18 months' work. Unfortunately the drop in the price of silver made the mine too low grade a proposition for the method used in operation, and it was closed down for several years. The ore, being chloride of silver, was crushed dry and amalgamated by the "Boss Process," which consisted in bringing the ore in direct contact with quicksilver in pans arranged in a continuous series. There are records of many other mines here, such as the Kohinoor; Cook and Thompson; Belle McGilroy; and others, but all of them are now idle.

The Bonanza King Mine. This property is owned by Messrs. Holbrook & McGuire, Crocker Building, San Francisco. It lay idle for some time after an active period about 1906, but was examined and a thorough report rendered. This aroused much interest and new development work was started in 1914. The mine again became a producer in 1915 with a good outlook for continued activity. This mine is at 4260 feet elevation.

The country rock is Carboniferous limestone, the ore deposit being of argentiferous galena in a silicified limestone breccia near a contact with intrusive monzonite. The breccia occupies a shear zone 400' to 600' wide, the strike of this being N.-S., and the dip 25° E., but the dip of the seams of ore varies greatly. The greatest depth below the surface is 465' and approximately 20,000' of underground work have been driven and stoped. The early day mill was destroyed by fire and, in 1906, a new 10-stamp mill, equipped with Western Gas engines of 50, 35, and 15 h.p., respectively, was installed by the Trojan Mining Co. The acreage is 220, of which 60 are patented. Mr. J. C. Gurney is superintendent at the mine.

Bibl.: Reports X, p. 532; XIII, p. 606.

Providence Group. This group of claims, located 15 miles south of the Bonanza King mine, is claimed by Sidney Dennis, J. A. Hopkins, and J. P. Borland, of Fenner, and consists of 220 acres. The deposit is gold in porphyry and decomposed granite. A small amount of development work has been accomplished.

Pilot Group. This group, comprising 120 acres, joins the Providence group on the north, and is owned by C. J. Eaton of Fenner. Several small shipments have been made, and the returns were sufficient to encourage negotiations for the installation of heavier machinery. This work is now progressing.

Silver Reef District.²⁷

Four miles northeast of the Black Hawk mines, and $2\frac{1}{2}$ miles from Old Woman's Springs, in the Mojave Desert, is an exposure of limestone and quartzite, resting on a massive crystalline rock, consisting of quartz, feldspar, biotite and hornblende. This exposure or reef extends from the mouth of Texas Cañon out upon the plain, its surface sloping downward at an angle of approximately 5° for a distance of 4 miles, terminating in a bluff 40' to 100' in height. Along the eastern edge the strata drop off abruptly as though sharply eroded. At the northern end the reef is faced by a low range of hills composed of the above mentioned hornblendic rock. From this point it swings west and with irregular outline extends for 5 or 6 miles toward Rabbit Springs. Its entire area, fully 25 miles square, is cut by gulches varying from 20' to 150' or more in depth, that have been eroded through the sedimentary strata down into the underlying crystalline rock. These cañons have resulted from natural drainage, having started in slight depressions in the rolling plateau of limestone. At one point on the extreme northern edge, hills of considerable size have been formed by the folding and tilting of the strata. The limestone has been subjected to violent compression, as throughout the area it is faulted and broken into a myriad of small fragments.

In viewing many mining claims on the reef and traveling over the greater part of its area, no piece of limestone was seen that would weigh 300 pounds, most of the pieces measuring under 6" or 8". Along certain zones considerable masses had been granulated and even pulverized. This fractured rock had subsequently been loosely cemented by the infiltration of carbonate of lime into the crevices.

It was at one time asserted that a shaft sunk in the reef passed through the limestone into the "wash" of the desert beneath. On investigation it was found that the limestone had indeed been cut through, but the underlying rock proved to be crystalline hornblende rock in place, but somewhat decomposed. Over considerable area the limestone is underlain by a quartzite stratum of variable thickness, less than a foot in some places, and in others 10' to 12'. Over some limited areas quartzite is wanting altogether. The limestone is mostly crystalline, varying in color. A small portion is pure white, the greater part is gray or bluish, and some of it is black.

²⁷Report XI, p. 365; XII, p. 377; XIII, p. 328.

The Ore Deposits. For fully 8 miles along the irregular front of the reef deposits of silver ore have been found. These ore deposits are usually marked by cherty siliceous rock, which, being harder than the limestone, stands out from its weathered surface in bunches and small, vein-like masses. Often, in breaking the cherty rock, stains of copper carbonate are found, and from such rock silver and sometimes gold is obtained. Numerous shafts, cuts and tunnels have been made on the claims, 20 or more in number, and in every one, ore of good grade has been found, although the quantity is usually small. A shipment from a claim called No. 1 returned 129 ounces of silver per ton in the Oro Grande mill. By assay 20 ounces could be found in ore from any of the claims, and rock of a higher grade running into thousands of dollars per ton was not unknown on the reef.

The ore occurred usually in bunches, sheets, or stringers, which "rolled" more or less, but in a general way followed the downward stratification of the limestone. The stringers were from 4" to 2' in thickness, pinching and swelling longitudinally in their downward extension. The average value of the ore thus far found, was probably about \$50 per ton. The mines were all opened by the discoverers who were men of limited means, and no systematic exploration for larger ore bodies has been made. They may exist, though there are no surface indications that such is the case. At one claim, No. 9, a sample was taken from 20 feet across the mineralized zone and found to assay 11 ounces of silver with \$2.00 in gold. This rock was taken from a shallow cut 4' wide, 5' deep and 20' long.

The ore deposits all occur in zones of limestone that has been crushed into small fragments. In a few places, in contact with or close to the ores, is a thin intrusive sheet of igneous rock much decomposed and leached. This, to a great extent, has, doubtless, been the source from which the minerals of the great ore deposits were derived. In many places the quartzite which underlies the limestone was found to contain galena, lead carbonate, wulfenite, zincblende, pyrite, copper, gold and silver. Some of this rock contained sufficient lead to be classed as a smelting ore.

The ores in the limestone were chiefly chloride of silver and embolite (chloro-bromide of silver), usually accompanied by copper-carbonate, sometimes a copper-silver sulphide, wulfenite, lead and iron in various forms, with occasionally manganese oxide in a gangue of calcite and quartz. Hornsilver in crystals was found in the fractures and in small cavities of a pure blue limestone, taken from a shaft on a claim at the east edge of the district. People in Pasadena, Riverside, Daggett, and Victorville were the principal owners of the claims. Timber could be obtained in the main range 5 or 6 miles back of the mines, and an abundance of water could be had from a cañon in the neighbor-

ing mountains or from Old Woman's Springs, $2\frac{1}{2}$ miles east of the principal claims on the reef.

According to the latest reports all properties in this district are now idle.

TUNGSTEN.³⁵

Up to the early part of the year 1915, the Atolia District in western San Bernardino County, with the adjoining Stringer District in Kern County, was practically the only tungsten producing area of any consequence in California. Production on a commercial scale began in 1905 in the Stringer District, followed by Atolia in 1906, according to the statistical reports of the State Mining Bureau. To the end of 1914 the output for the State amounted to a total of \$1,513,936. For 1914, Atolia led the entire United States, its tungsten yield for that year surpassing that of the Boulder Creek District in Colorado. The output of San Bernardino County for 1915 was \$840,947 and for California \$1,005,467.

During the latter part of 1915 and the early months of 1916, because of the high prices prevailing, prospecting was much stimulated and the known tungsten-bearing areas have been considerably extended both in San Bernardino and Kern counties. Shipments have also begun from mines opened up in the Clark Mountain and New York Mountains districts in eastern San Bernardino County. In these latter areas, wolframite and hübnerite are the principal ores with some scheelite, while at Atolia it is scheelite only.

Atolia District.

Atolia is five miles south of Johannesburg, on the Kramer-Johannesburg branch of the Santa Fe. For comparison and because it merges into the Atolia District on its margin, it may not be out of place to first briefly outline the characteristics of the adjoining Stringer District, though described in a recently issued report of the State Mining Bureau on Kern County.³⁶ The one is in eastern Kern and the other in western San Bernardino, the division being mainly an artificial one, and marked only in part by a low ridge in the northern part of the area under consideration (*see* Map, Plate III). The Stringer District, so called because of its being characterized by narrow stringers and seams in schist, is on the eastern slope of the Rand Mountains. These stringers have been worked to a greater or less extent for some years for their gold content. There are other associated stringers carrying scheelite. Though somewhat closely associated, the gold and tungsten, for the most part, do not seem to be found in the same veins. Passing down the slope southeastward toward Atolia, the topography is that of shallow ravines and low, rolling ridges. From the placer wash in this area considerable

³⁵Supplemented and revised to June, 1916, by observations at Atolia of Walter W. Bradley, mining statistician of the State Mining Bureau; and to July, 1916, in the Clark Mountains, New York Mountains and Signal districts by Emile Huguenin, field assistant.

³⁶Mines and Mineral Resources of Fresno, Kern County, etc., 1915, pp. 59, 96.

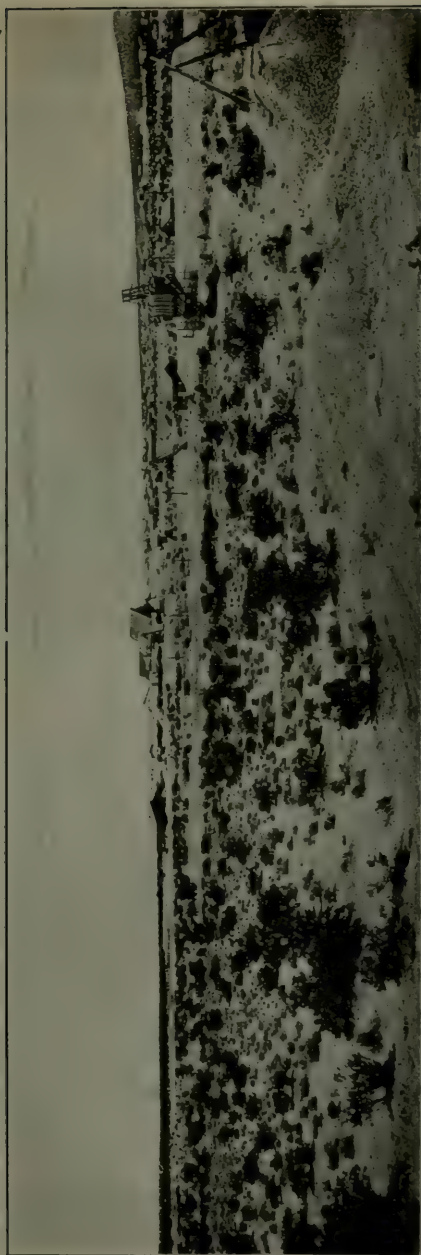


Photo No. 19. Panoramic view of Atolia, San Bernardino County, looking westerly from Skylark shaft of Oedick Group. Atolia Mining Co. mill in center; "Spanish Lease" (Atolia Co.) headframe and ore-bin, right center. The light colored streak of ground stretching from Atolia mill to left limit of picture is the "Spud Patch." On the skyline back of the Spanish Lease headframe may be seen a part of the Rand Mountains in Kern County. Photo by Walter W. Bradley, June 2, 1916.

of its western edge may have been derived from the Rand Mountains along the upper part of the slope. At and near the surface the granite is largely decomposed and disintegrated into a yellowish-brown, angular



Photo No. 20. Home-made, hand-driven, dry concentrator, working scheelite placer ground at Atolia. Photo by C. A. Waring, March, 1916.

sand. In this sand at certain places are found pieces of scheelite derived from the veins, and varying in size from small bits up to masses weighing up to 100 pounds and more. Such an area is the now famous "Spud Patch" of the Atolia Mining Company, so called because these scheelite masses were dug up much as one would dig potatoes out of the ground. This placer scheelite, except in the deepest ground at the eastern end of the district, is quite angular, showing that it has not traveled far from its parent body. The placer scheelite is also high grade, when well cleaned, assaying above 70% WO_3 .

The scheelite veins of Atolia occur in a zone in the granite, some 2000' to 2500' wide and nearly two miles in length, coursing about 10° S. of W. The dip is north and varies from 13° to 80° . A fresh specimen of this granite taken from the "Spanish Lease" dump of the Atolia Company and examined in thin section under the microscope showed it to be a biotite-hornblende granite, with the hornblende in part altered to pyroxene (probably augite). The feldspars are orthoclase and albite. Magnetite, titanite and apatite are present as accessory minerals. The entire structure of the rock shows it has been under a

tremendous strain. Macroscopically it is a medium-grained, gray granite. To the north of the granite is a schist area.

Though this tungsten-bearing zone has been proven for a length of approximately 10,000 feet along its strike, the individual veins are not continuous for any considerable distance. They are parallel and



Photo No. 21. The Winans combination jig and sluice in operation near Atolia on placer ground carrying scheelite.

overlap each other much like the longitudinal cracks in a well-dried stick of timber. At both the east and west ends of the zone the veins appear to feather out. The sketch map, Plate III, shows the approximate relative positions of the main properties. The outlines there given are approximate only.

In the placer ground both in the Stringer and Atolia areas during the height of the boom several different styles and forms of concentrators and "washers" (both wet and dry) were in use—some of them crude home-made contrivances. Of the more successful wet machines may be mentioned a combination sluice and jig (*see* Photo No. 21) consisting of a short sluice-box with riffles, and a screen bottom. Water is forced up through the screen from a compartment underneath; and the sluice-box has an endwise shaking motion similar to a table concentrator. Of the dry concentrators the Stebbins (*see* Photos Nos. 22-23) seemed to be doing satisfactory work.

Water is, of course, scarce. A partial supply is obtained from the pipe-line of the Randsburg Water Company. This is supplemented by water brought in by the railroad in tank cars from Hinkley station on

the main line, between Barstow and Kramer. A 10,500-gallon tank car of water costs \$18.40 at Atolia or Johannesburg. Needless to say tailings are run to settling ponds and tanks and the water re-used.

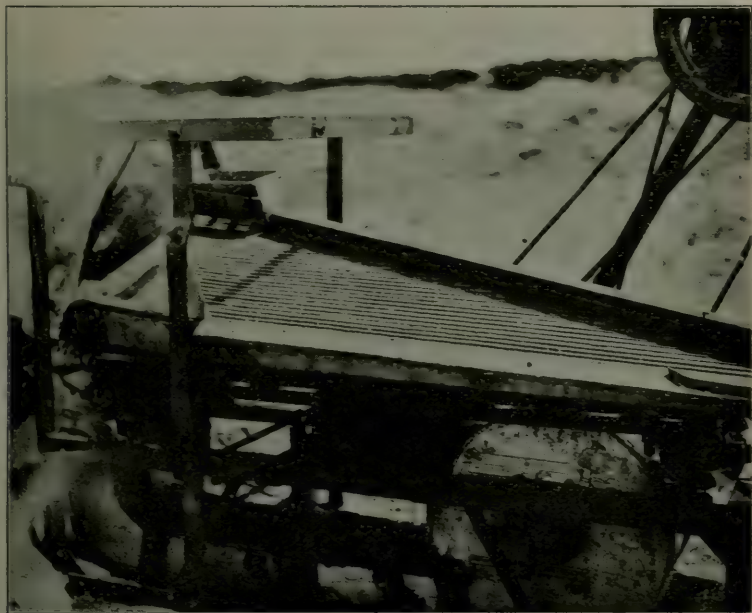


Photo No. 22. Stebbins dry concentrator. The top is a diamond-slotted screen, with riffles, and an air chamber underneath. Photo by Walter W. Bradley.

Atolia Mining Co.: E. C. Voorhies, president and manager; E. A. Stent, secretary; office, 1404 Humboldt Bank Bldg., San Francisco; Chas. S. Taylor, superintendent at the mine. The elevation is 3300 ft. (U. S. G. S.) at Atolia station. The company has 62 patented claims and 35 locations unpatented. The deepest shaft (No. 1) and the greatest extent of underground development work are at the west end of the group. No. 1 shaft is 900' deep, with a winze from the bottom level reaching a little below 1000'. Good ore was obtained on the 200', 300', 400', 600', 700', 800' levels, and some on the 900', the 800' level being the best. On the 900' level, the amount was small, but the ore has come in again in the winze. The largest shoot, so far, has been opened up for a continuous length of 1400', along the vein. There are a number of other shafts varying in depth to 335'. As already stated in a preceding paragraph, the individual veins are not continuous throughout the two-mile length of the zone, but are parallel and overlap. In the Atolia company's ground, these veins vary from mere seams up to

3' in width, and dip from 13° to 80° N. (except one which dips S.). In the larger veins the scheelite is massive, like the specimen on exhibition in the museum of the State Mining Bureau, and assays up to 80%

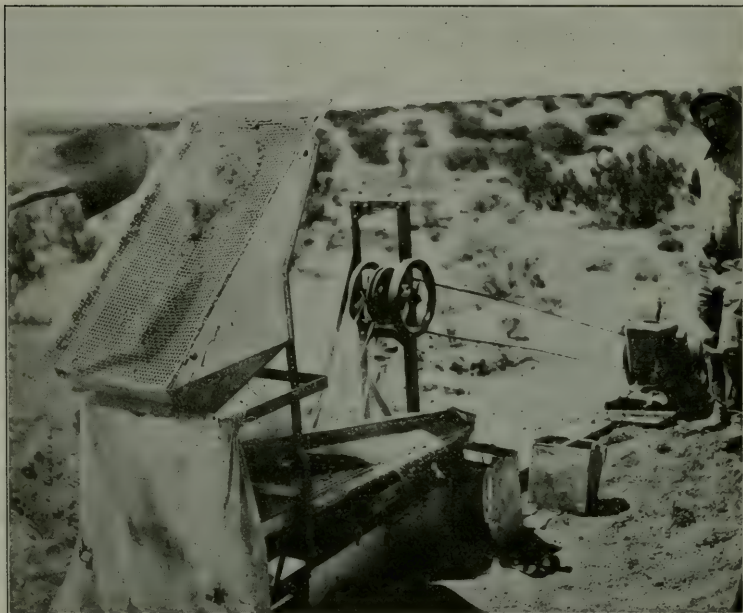


Photo No. 23. Stebbins dry concentrator in operation, concentrating scheelite from placer wash on Leonard Group near Atoia. Photo by Walter W. Bradley.

WO_3 . The other vein minerals occurring here and in part very intimately associated with the scheelite, are quartz and calcite. The scheelite is pinkish to yellowish white in color and in general appearance somewhat resembles orthoclase feldspar (but of a higher specific gravity, of course).

The concentrating mill which the company had built in the latter part of 1915, was destroyed by fire in January, 1916, and a new mill of 70 tons daily capacity has since been erected. When visited (June 2, 1916) this mill was operating at about half capacity. A Huntington mill is used for grinding, and the pulp is handled on the following concentrators: Wilfley, both single and double-deck Deisters, and Johnston vanners. The concentrates, before being sacked for shipment, are dried on the flat top of a special, low-built furnace fired by oil. About 60,000 gallons of water are consumed daily. The tailings are run to settling ponds, and the water pumped back to the mill tanks.

During 1915, considerable of the eastern portion of the company's ground, including the "Spud Patch," was worked by leasers. With the expiration of the leases at the beginning of the new year, and the completion of the mill, the entire property was operated on company account. As a consequence of the high prices prevailing for tungsten during the early months of 1916, "high grading" became notorious; and the company, as a matter of self-protection, was obliged to curtail operations in certain areas, particularly in the Spud Patch.



Photo No. 24. West end of the "Spud Patch," Atolia Mining Co., at Atolia. Depth of placer wash, 10 inches to 2 feet. Photo by Walter W. Bradley.

Gustave Group, located south of Atolia townsite on the west side of the railroad and adjoining the Atolia Company's ground. Some coarse float has been obtained by trenching in the course of which some small veins have been uncovered.

Halloran Claims (see Leonard).

Leonard Group. A Mr. Leonard has options on two or three groups of claims east and southeast of No. 1 Atolia shaft. This includes 5 claims owned by Mrs. Halloran of Long Beach (one of which, a patented claim, is the only break in the continuity of the main group of the Atolia Company's claims) and 3 claims of a Mr. Gallagher of Los Angeles, C. D. Crane et al., Randsburg, are leasing. They are operating mainly in the placer ground on the south side of the group, with dry concentrators. (See Photos, Nos. 22 and 23.) In the lode ground a maximum depth of 90 feet has been reached and some 2% ore taken out.

McBride Group (see Treasury).

Osdick Group. P. J. Osdick, Atolia, owner. This group which consists of eleven claims, part of them patented, adjoins the Atolia Company on the east; and has been the most important single producer in

the district outside of the Atolia. The Skylark claim of this group is the one adjoining the Atolia ground, and is under lease to R. F. Bibb et al. This claim under the Lypps & Brock lease (expired in April,



Photo No. 25. At east end of the "Spud Patch," Atolia Mining Co. Depth of placer wash, about 18 feet. The best values are found close to bedrock. Photo by Walter W. Bradley.

1916) is the one from which the famous pocket of 14 tons of high-grade vein scheelite sold for \$45,000 in March, 1916. It was stoped from above the 50-foot level. The present lessees on this block are sinking the Skylark shaft below 150' and drifting on the 50' and 100' levels. Some good stoping ground is reported blocked out between these two levels.

Other portions of the group are also being worked by leasers. There are several other shafts, 40', 50', 60' and shallower in depth. Most of the Osdick group is in the lode zone, but there is some placer ground in the southeast corner, having a depth of 18'-20' to bedrock.

The Quirk claims are one mile north of Atolia on a 4-inch vein which is parallel to the main Atolia system. There is a 40-foot shaft from which a small tonnage of high-grade scheelite has been taken.

Rose Fraction, R. Scott and F. Weise, owners, Atolia. Small production.

The Scheelite Group, located by a Mr. Hart of Los Angeles, partly overlaps the Treasury group on the south.

Toboggan Group, Elmer Beebe et al., Atolia, owners. It is about $\frac{1}{2}$ mile south of the Atolia mill. One small lot of high-grade ore was obtained from a pocket near the surface; but when visited, no lode mining was being done. Leasers were taking out some high-grade placer gravel and coarse float.

The Treasury Group, owned by D. V. McBride, M. H. Elliott and C. W. Peterson adjoins the Atolia and Osdiack groups on the south and east. The claims have been divided into 40 blocks of about 200 feet square each; and in May, 1916, were being worked by some 26 sets of leasers. This is placer ground similar to the "Spud Patch" of the Atolia company, but deeper, averaging 20'-25', though some of the shafts are as shallow as 12'-15' to bedrock, while one lease has pay dirt at 54'.

White Flower Claim, A. Nixon, Randsburg, owner. Developing.

Clark Mountain District.

This district embraces that portion of the old Ivanpah District in the immediate vicinity of Clark Mountain. It is reached by road from Nipton, Cal., or Roach, Nevada, both of which are stationed on the Salt Lake Route. Tungsten ores were discovered on Clark Mountain about eight years ago, but it was not until the enormous increase in the price of that metal during the past winter that active work was undertaken. Many locations were made, but only one producing mine has as yet been developed.

Mojave Tungsten Company, 165 Broadway, New York; Foster S. Naething, general manager. This company, incorporated in November, 1915, owns a group of ten patented claims, and has locations on two others. Wolframite and scheelite occur associated together in a system of narrow quartz fissure veins in granite. The ore is fairly high grade, bunches often encountered containing 30% tungstic oxide. Considerable development work has been done and it is reported that a large tonnage of ore has been blocked out. A small concentration plant has recently been completed and the property is producing about one ton of high grade concentrates daily. Twenty men are employed.

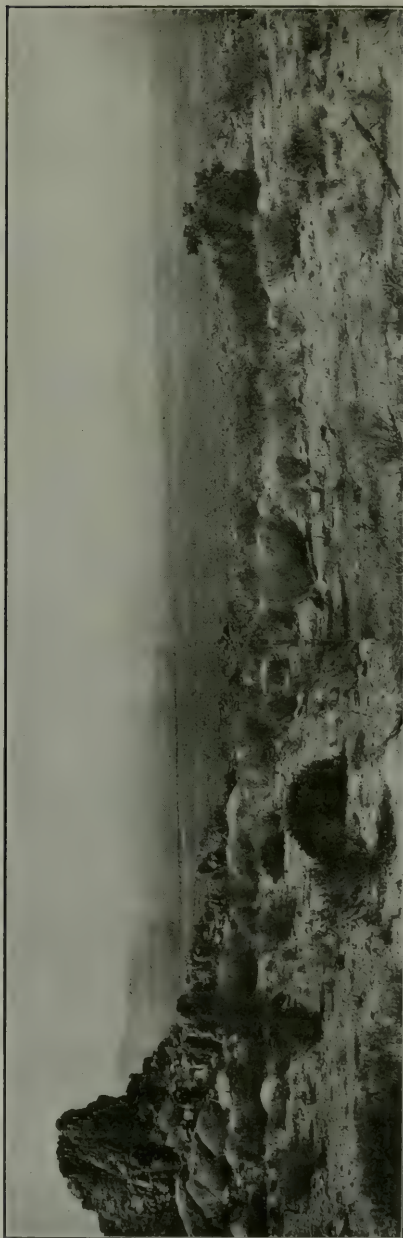


Photo No. 26. Ivanpah Valley, looking northward from base of New York Mountains.

New York Mountains.

The New York Mountains lie in the northeastern portion of the county trending in a general northeast and southwest direction. They are an extension of the Providence Mountains. The geology of the region is simple. Quoting from our Report XIII, p. 325: "The nuclear mass of the range is grano-diorite, which has uplifted the older sedimentary rocks on its flanks, the upper portion or dome of the great anticline having been eroded, leaving only the very rugged line of serrated peaks and ridges flanked on both sides and about the ends of the range by quartzites, limestone, mica schist, and conglomerates."

The grano-diorite has been intruded by a system of pegmatitic dikes which lie parallel to the structural trend of the range. It is in these dikes that the tungsten ores occur. On the north slope of the mountain the ore, wolframite, is deposited in well-defined quartz veins in the pegmatite. The veins vary in width from 2" to 1'. On the south slope wolframite and hübnerite are found disseminated throughout the dike rock and not in any regular vein systems. The discovery of the tungsten ores in these mountains is of very recent date, and practically no development work has been done. The discoveries on the north slope have been confined to Cliff Cañon, about 5 miles southwest of South Ivanpah, at elevations which range from 4800' to 5500', while those of the south slope lie in that portion of the range due south of the former but closer to the summit, the elevation being from 6500' to 6700'.

Carbonate Group. J. R. Comerford, Matt McCarthy and Geo. Carruthers of South Ivanpah have a group of six claims in Cliff Cañon on the north slope of the New York Mountains 2 miles southeast of Brant, a station on the Salt Lake Route. These claims are named: Carbonate, Ruby, Lucky Strike, North, Ella May, and Oversight. A fairly good wagon road which, with little expense, could be made an auto road, connects the railroad with the camp. Wolframite is deposited in narrow quartz veins varying from 2" to 1' in width. Six distinct veins have thus far been located. They strike in a general northeast and southwest direction, almost with the trend of the dike in which they occur. The quartz is very friable and free of impurities, carrying only occasional pyrites with the wolframite, which makes in bunches in the quartz. An old tunnel driven several years ago on the Carbonate claim by the Garvanza Mining Company cut an 8" vein which shows excellent values in the face. The owners are now drifting on this vein and have taken out several hundred pounds of high grade ore. Only surface work has been done as yet on the other veins, all of which show good values. Water for working purposes is obtained from a 35-ft. well sunk in the cañon below the old Garvanza mill. The owners will sell this property on very reasonable terms.

R. H. Shafer, E. W. Schloerb, and W. L. Field of Ivanpah have filed locations on a group of five claims in Cliff Cañon adjoining the group described above. No development work has as yet been done.

Sagamore Mine (see under Copper).

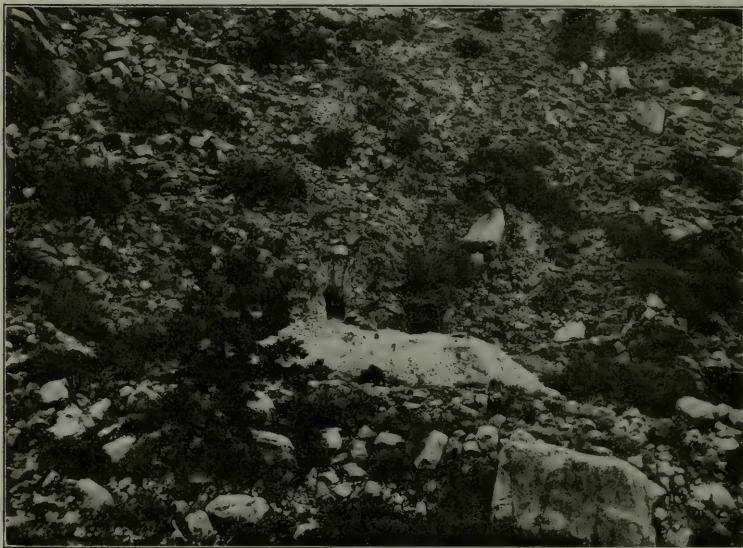


Photo No. 27. Carbonate tunnel on property of J. R. Commerford et al., cutting 8 inch tungsten bearing vein. Owners now drifting on this vein. Cliff Cañon, New York Mountains.

Tungsten King Group, consisting of seven claims, lies on the south slope of the New York Mountains at an elevation of 6700 feet and is 15 miles north of west of Ledge Station. Small crystals of hübnerite and wolframite occur irregularly disseminated throughout a pegmatitic dike which varies in width from 25' to 60'. (See photos Nos. 29 and 30.) The dike strikes N. 75° E. and pitches almost vertically to the south. It outcrops for at least 1200' along a saddle of the mountains, 1000 ft. in elevation above the camp. There has been no development work on this property as it was located quite recently (May, 1916). A few tons of high grade ore, mostly float, found in the vicinity of the dike, have been sacked and are ready for shipment. It is estimated that this dike contains between 1% and 5% of tungstic oxide. The ore is very clean and free from base metals, the gangue being quartz and feldspar. It concentrates very easily, as shown by the test run made at the Reynolds Mill at Goffs (see below). It suffers the disadvantages of being rather inaccessible and lack of water—the nearest water being hauled from a well in the wash below the Gold Chief mine, five miles

by road from the camp. The owners claim to have refused an offer of \$100,000 for the property. Owners, J. F. Brooke, F. M. Brooke, F. W. Chausse, and J. G. Bliss, Goffs, Cal.

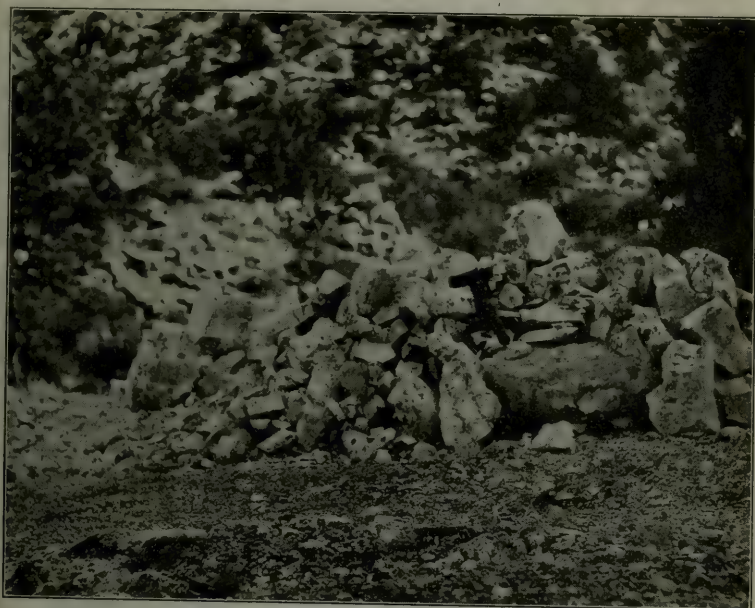


Photo No. 28. Tungsten ore at mouth of Carbonate tunnel. The wolframite shows as black spots in the rock.

Many **other claims** have been located in this district, but there was practically no work being done on them at the time visited.

The Signal District.

This district lies in R. 18 and 19 E., T. 11 N., S. B. M., from 6 to 10 miles, by fairly good desert road, north of Goffs. The general altitude is about 3500 ft. above sea level. It extends in a N.W.-S.E. direction for about 4 miles over low rolling hills and presents the usual much weathered, broken, desert condition.

The geology of the district is simple, consisting essentially of granite underlying altered limestone and intruded by diorite and pegmatitic dikes. The limestone has been eroded to a great extent and the granite is exposed over large areas. The ore is deposited in quartz veins that occur both as contacts along the limestone and the granite, and as fissures in the granite. It is mostly wolframite, although occasionally hübnerite is found. The wolframite is usually deposited in fairly large crystals and makes in bunches in the quartz. The hübnerite has been found in small elongated crystals disseminated throughout the quartz.

The occurrence of tungsten ores in this district has been known for some time, but it has been only within the last six months that much interest has been aroused. The high price of this metal, during the

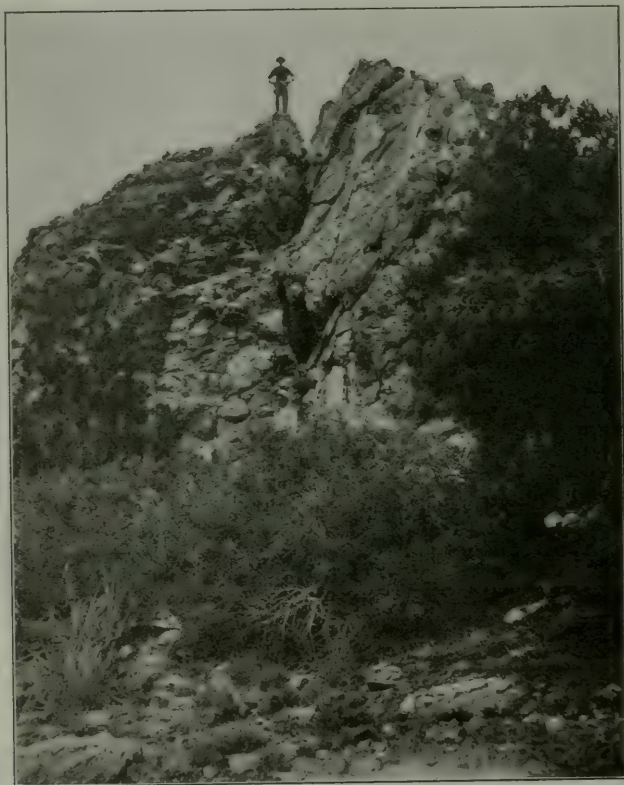


Photo No. 29. Exposure of pegmatitic dike, carrying wolframite and hübnerite at western extremity of outcrop of the Tungsten King Group, New York Mountains. The dike is here at least 60 ft. wide.

early spring, led to considerable prospecting and many promising prospects are now being developed. A few small shipments have been made, most of which were from rich float found in the vicinity of the outcrops. Some of the ore was hauled to Goffs, where a small custom mill was erected. (See Reynolds Mill below). The completion of the 50-ton concentration mill of the Louisiana California Mining Company (see under Vanadium) which is to treat custom tungsten ores, should be a big factor in the further development of that district.

The **Argosy Mine**, consisting of three claims, is six miles north of Goffs and is the most southerly deposit of that district. The ore is

deposited in finely disseminated crystals of hübnerite and wolframite in a system of veinlets in a pegmatitic dike. These veinlets, varying from 4" to 6" in width, strike with the general trend of the dike, east and



Photo No. 30. Eastern extremity of the outcrop on the Tungsten King Group, New York Mountains.

west, and dip about 45° N. The ore is said to average 2%. Development consists of a 140' drift along the dike and a 38' raise which connects the face of the drift with the surface. Water for working purposes is hauled by motor truck from Goffs. Idle at the time visited, but a bond had been given on the property and it is expected that operations will be resumed on the completion of the Louisiana California Mining Company's mill, 2 miles north of the mine. Owners, E. E. Fuller and C. B. Jacobs, Goffs, Cal.

J. C. and W. O. Kinsman, of Goffs, have a group of claims in this district 8 miles north of Goffs, and are prospecting for tungsten ores. Rich float has been found on a number of their claims.

Lombard and Main, formerly the California Vanadium Company, have a large number of claims adjoining the property of the Louisiana California Mining Company and have uncovered a few promising veins. Some development work was done several years ago on gold-bearing veins on this property, and the later work is practically all superficial. Several tons of fairly high grade float have been found and treated at

the mill lately erected by the owners. The mill consists of Braun rolls and a Stebbins dry concentrator. About one ton of concentrates, that is said will average 75% tungstic oxide and are being held for higher market price, have been produced. The dry concentrator is reported to be thoroughly satisfactory for the treatment of this ore. It is operated by a gas engine. Mill was idle when visited, as the owners were doing some prospecting work on their claims. Owners, A. L. Lombard and J. F. Main Estate, Goffs; office address, 540 I. W. Hellman Bldg., Los Angeles.



Photo No. 31. Looking southward from the Tungsten King Group in the New York Mountains, approximately 1200 ft. in elevation above the floor of the cañon seen in the middle distance.

Joseph Lord and A. A. Irish, Grosse Bldg., Los Angeles, have a group of 32 claims ten miles south of Goffs, and extending to the southern limit of the district. A 75-ft. well was sunk on the property and this gives sufficient water for camp uses. As the locations were made in March, 1916, there has not as yet been any great amount of development work done. Most of the claims are being worked by leasers and a number of shafts are now being driven on the different veins. The general strike of the veins is N. 40° W. and the dip 60° to 80° NE. The greatest depth attained when visited was that on the

Mills, Beauchamp, and Binney lease; 80 ft. on the vein. The vein showed excellent values throughout its depth, and stoping is being done on the 50 ft. level. The ores from this property are concentrated by hand jigs erected at the well (see Photo No. 33). A small jaw crusher



Photo No. 32. Dry concentration mill of Lombard and Main, Signal District, 8 miles north of Goffs.

operated by a gas engine reduces the ore to the required size before jigging. Some small shipments were made during the early part of the summer, and several tons are now ready for shipment. The following leasers are working one or more claims each at this property:

Baker and Binney

Boose, Michael & Buchanan Co.

Cox, F. B.

L. F. Grosbeck, C. C. Grosbeck and Sam Tinker

George Irving and Roy Schumaker

K. G. Lyons, F. Pisch and F. Cordier

Mills, Beauchamp & Binney

all of Los Angeles, Cal.

Reynolds Custom Mill was erected last spring by H. I. Reynolds of Boulder, Colo., at Goffs, to treat the tungsten ores of the Signal and New York Mountain districts. The mill consists of a jaw crusher, Hendricks rolls, two Morse Bros. jigs, and a Deister concentration table. A 25 h.p. gas engine was installed to operate the mill—capacity said to be 25 tons per 24 hours. Water was bought from the Santa Fe R. R. Co., who have wells at Goffs. This mill was operated only a few days on some ore from the New York and Signal districts and proved a failure. The ore was not crushed fine enough and did not make a clean

concentrate. Mill is now idle and it is reported that it is to be remodeled.



Photo No. 33. Custom Mill at Goffs, built by H. I. Reynolds for concentrating tungsten ores of the Signal and New York Mountains districts.

As in the New York Mountains **numerous claims** have been taken in this region, but the work thus far has been entirely superficial. The decline in the price of tungsten during the summer has somewhat dis-



Photo No. 34. Rock crusher and hand jigs at well on the Lord and Irish property, Signal district.

couraged many of the locators, so that the district is not as active as it was when the higher prices prevailed.

Tungsten ores have also been found in the **Providence Mountains**, the southwestward extension of the New York Mountains. Several

properties were worked during the spring, but are now idle, and it is said that some excellent ore was found. The ore is wolframite and its occurrence is said to be similar to that of the New York Mountains. The following parties made small shipments from this district: **Edward Bluett** of Kelso; **Desert Mining Company**, A. B. Carpenter, manager,



Photo No. 35. Eureka shaft of the Boose, Michael & Buchanan Co. lease, Signal district. Union League Bldg., Los Angeles; **Pierce & Creighton**, American Bank Bldg., Los Angeles.

The occurrence of **Tungsten** is also reported near the old Rose mine in Rattlesnake Gulch, and near the new gold camp of Goldstone. See also Four Brothers Mine, under Gold, p. 41.

VANADIUM.

The only known occurrence of vanadium ores in California is that found in the Signal District, 8 miles north of Goffs at the properties of Lombard and Main, and the Louisiana California Mining Company. The ore occurs in the gold quartz veins and has been identified by Schaller as cuprodescloizite.⁴⁰ "Samples of vanadium ore sent to Schaller by A. L. Lombard and J. F. Main from Camp Signal proved to be coated with cuprodescloizite (21% V_2O_5 in the mineral). The associated lead minerals are cerusite and vanadinite from which the cuprodescloizite seems to be derived. A qualitative test showed the presence in quantity of lead, copper, zinc, vanadium, and a little water.

⁴⁰Journal Wash. Academy of Science, 1911, Part I, p. 149.

A direct quantitative determination of the vanadium gave 21% of V_2O_5 . The material when examined under the microscope was seen to be well crystallized in minute, colorless, or pale yellow plates. Some of these are square or oblong, others irregularly shaped. * * *

While there has not been as yet any commercial production of vanadium, we may expect such production during this year with the completion of the new concentration mill of the Louisiana California Mining Company.



Photo No. 36. Camp of the Louisiana-California Mining Co., Signal District, 8 miles north of Goffs.



Photo No. 37. New 50-ton mill of the Louisiana-California Mining Co. The head-frame of the 900-ft. shaft is seen at right extending above the top of the mill. The 200 ft. shaft is indicated by the headframe and dump at the left.

Louisiana-California Mining Company, F. L. Mairn, president;
C. P. Carmody, secretary, Cotton Exchange Bldg., New Orleans; Fred

Leiser, manager, Goffs. This property, consisting of 8 claims, and developed essentially for gold, reports the occurrence of vanadium in the lower workings of the mine. The vanadium occurs as a coating along seams in the quartz vein in the form of cuprodescloizite. The vein

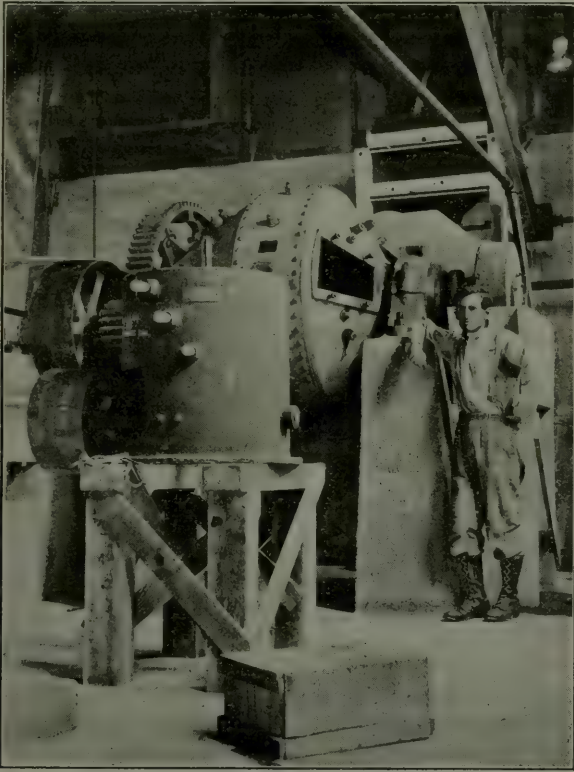


Photo No. 38. Hardinge ball-mill in plant of the Louisiana-California Mining Co. Clean-up pan in the foreground.

varying from 4' to 12' in width is deposited along the contact of granite and porphyry. It strikes N. 60° E. and dips 45° N. The development consists of two vertical shafts of 900' and 200', respectively, with numerous levels, crosscuts and drifts. The 900' shaft was driven for water and supplies approximately 2000 gallons per 24 hours. These shafts are not connected and will later be abandoned as working shafts as they are of only one compartment and inadequate. It is planned to sink a two-compartment working shaft north of the 900-ft. shaft and cross-cut to the vein. Both of the shafts are equipped with gas engine hoists. Some stoping is now being done on the 150' and 200' levels of

the 200' shaft. Air drills are used. The ore will be concentrated at the new 50-ton mill erected just east of the 900' shaft.

The flow sheet is, briefly, as follows: Ore is fed to a No. 3 Gates gyratory crusher, sized to crush 1" or smaller, and elevated by a 35 ft. 9" bucket conveyor to a 250-ton storage bin above the mill, then by gravity to a Challenge automatic ore feeder and into a 4½' Hardinge ball mill, rated at 50 tons capacity. It is discharged through a 20-mesh screen onto a specially designed shaking amalgamator, then going to two 5' x 10' amalgamation copper plates; subsequently to a Richards hydraulic classifier. The coarse sands are diverted to a Wilfley table, while the slimes go to a Deister slimer. The middlings from the Wilfley table are returned by a 3" Byron Jackson slime and sand pump to the ball mill for regrinding. The table tails are run to a 5' Avoca dewaterer, and the water returned to the circuit. The dewatered tails are to be stacked by a 50-ft. belt conveyor, without further treatment. A 120 h.p. Western gas engine will supply power for the mill, for the air compressor, and for a 25 k.w. generator which is to supply light for the plant.

This company will treat custom ores of the district in lots of not less than 50 tons at \$5.00 per ton, and expect to start milling in September, 1916.

ZINC.

(See under Lead—Zinc.)

NONMETALLIC MINERALS.

San Bernardino County has a wealth of crude materials in the non-metallic minerals, in addition to the metals described in the preceding pages. The following are among those which are either operative or potential: asbestos, barite, borax, cement, clays, fuller's earth, gems, granite, graphite, gypsum, infusorial earth, limestone, marble, mineral paint, mineral water, nitrates, petroleum, salines (including salt, soda and potash), sandstone and talc.

ASBESTOS.⁴¹

Fire-Proof Mine, J. B. Friend, Victorville, locator. This mine is situated about 4 miles west of Cottonwood, a station on the Santa Fe Railway, probably in the southeastern part of T. 9 N., R. 4 W., S. B. M. The asbestos is stated to occur in a seam in a shale country rock, from 5' to 6' wide. A small portion of the asbestos is claimed to be of rather good quality. None has been shipped. This is probably the same mine mentioned under the name of Scorpion in the Ninth Report of the California State Mining Bureau, p. 236.

In the Mining Bureau museum is a specimen of asbestos from near Barstow.

⁴¹Bulletin 38, p. 263.

BARITES.

L. A. Davis, Staggs post office, reports he has a deposit of barite near Ludlow; also dolomite and a strontium mineral (probably celestite). He also states he has a deposit of fluorspar, $\frac{1}{2}$ mile from Ludlow.

Ellis Mallery and associates, 214 H. W. Hellman Bldg., Los Angeles, are opening up a deposit of crystalline barite, stated to analyze up to 96% BaSO_4 , near Barstow.

O. D. Mansfield of Barstow reports the occurrence of barytes on his claims six miles north of Barstow. The barite is deposited in a vein averaging 3' in width in limestone. It is said that the vein can be traced for 2000 ft. The deposit is undeveloped. Several other minor deposits are reported in that vicinity none of which have been developed.

Bibl.: Bulletin 38, p. 264.

T. G. Nicklin of Barstow, reports that he has a deposit of witherite (barium carbonate) associated with strontium carbonate.

BORATES.

(See also under Salines.)

The production of borax in San Bernardino County was for many years its leading industry, but with the exhaustion of the colemanite mines of the Pacific Coast Borax Company near Calico in 1904 it ceased and there has been no recent work on the many other deposits, most of which are low grade, marsh or playa deposits which could not compete with the colemanite deposits of Inyo, Los Angeles and Ventura counties.

The **Calico** deposits were by far the most important ones in the county and have produced over \$9,000,000. As these deposits were described in detail in former publications of this bureau no further mention will be made of them here. The ruins of the Pacific Coast Borax Company's concentrator, four miles north of Daggett, and of the Blumenberg plant, bear mute testimony to the former activity of that now dormant district.

Bibl.: Reports IX, p. 225; XI, p. 345; XII, p. 35; XIII, p. 46;

Bull. 24, pp. 56-60.

The **Searles Lake** borax beds were the first worked in the county. They were discovered in 1868, but not worked until 1874. From then on to 1881 the principal production of borax was from this marsh deposit worked by the San Bernardino Borax Mining Company. The physical peculiarities and probable origin are described by Dr. H. De Groot in the State Mining Bureau Report X, as follows:

"Locally considered Searles' marsh lies near the center of an extensive mountain-girdled plain, to which the phrases 'Alkali Flat,' 'Dry Lake,' 'Salt Bed,' and 'Borax Marsh' have variously been applied, the

contents and physical features of this basin-shaped depression well justifying the several names that have been applied to it. It is, in fact, a dry lake, the bed of which has been filled up in part with the several substances named. Its contents do, in reality, consist of mud, alkali, salt and borax, largely supplemented with volcanic sand. This depression, which has an elevation of 1700 ft. above sea level and an irregular oval shape, is about 10 miles long and 5 miles wide, its longitudinal axis striking due north and south. It is surrounded on every side but the south by high mountains, the Slate Range bounding it on the east and north, and the Argus Range on the west, the view to the south being shut out by low mountains, conical peaks and broken hills which break away to the southeast. Conspicuous in that direction stands a series of splintered buttes, so slender and pointed that the name 'Needles' has been applied to them.

"No doubt but this basin was once the bed of a deep and wide-extended lake, the remains of a former inland sea. The shore line of this lake is distinctly visible along the lower slopes of the surrounding mountains at an elevation of 600 ft. above the surface of the marsh. Further up, one above the other, faint marks of former water lines can be seen showing the different levels at which the surface of the ancient lake has stood. In the course of time this lake was extinguished, having been filled up with the wash from the adjacent mountains, originally much taller than they are now."

The **American Trona Corporation** is constructing a large plant at Searles Lake for extracting these salts. (*See* under Salines.)

Bibl.: Report X, pp. 534-539; Bull. 24, pp. 63-65; U. S. G. S., Bull. 580-L.

Colemanite has been discovered in a well on a ranch 9 miles by road northwest of Kramer, in Sec. 22, T. 11 N., R. 8 W., S. B. M. A bed of colemanite 40 ft. in width was encountered at a depth of 370 ft. The deposit is bonded to the Pacific Coast Borax Company, but no further work has been done on it.

Bibl.: U. S. G. S. Min. Resources 1914, Part II, p. 287.

Numerous other borax deposits occur in different parts of the county, none of which have been developed. The following descriptions of them are taken from the report of Dr. Gilbert E. Bailey.⁴²

Cave Springs. Borax deposits, consisting of borate of lime associated with carbonate of soda, salt, and sulphate of soda, have been recently located southeast of Cave Springs, near the Daggett road, but no development work has been done. It is reported that borate "mud beds" similar to those near Daggett have also been discovered in this district, which lies along the south flank of the Avawatz Mountains.

⁴²Bulletin 24, "The Saline Deposits of Cal.," pp. 60-64.

China Lake. This playa lake lies partly in this county and partly in Kern County. It is located in R. 40 and 41 E., T. 25 S., M. D. M. It was once a part of Searles Lake, being really a pool or depression in the southwest portion of that lake in recent geological times. Deposits are similar to those of Searles Lake. Undeveloped. E. E. Teagle, C. H. Churchill et al., Johannesburg, Cal., owners.

Coyote Holes or Willow Springs Lake. The playa lake, about 20 miles northeast of Daggett, is locally known as Coyote Holes, or Willow Springs, from two springs on its north and south edges. It is in T. 11 N., R. 2 E., S. B. M. At Coyote Holes is a "marsh" of about 300 acres that is surrounded by a crust of borax. The marsh itself is mainly a carbonate of soda bed. The borax is mainly ulexite or "cotton ball" borax, and is undeveloped.

Lone Star. Beds of colemanite have been discovered in the south flank of the Lone Star Range, almost directly north of Leach's Spring, in T. 18 N., R. 2 E., S. B. M. These beds are from 3' to 5' thick and outcrop for intervals for a distance of about two miles.

Lone Willow. Outcrops of colemanite similar to those of Lone Star have been discovered a few miles west of the Lone Willow Springs in the south flank of Brown's Mountain. No development work has yet been done upon them.

Lower Cañon Beds. In the alternating strata of sedimentary beds in the Lower Cañon niter beds, situated in the cañon of the Amargosa River, evidence of the presence of borates has been found. Colemanite and ulexite have both been found as "float," and an examination of the numerous strata will in all probability show the existence of beds of commercial value.

Mojave Sink. The sink of the Mojave River is situated in T. 11 to 13 N., R. 8 and 9 E., S. B. M. Borax has been found in the playa layers of this lake that is locally known as Soda Lake. It is associated with the carbonates and sulphate of soda, but no attempt has been made to explore the deposits to see if the borax exists in commercial quantities. Around Borax and Barrel Springs the borax is too spotted and in too small quantities to be of value. Borings might give waters carrying values.

Owl Springs. The Owl Springs, or Owl Holes, are located in T. 18 N., R. 3 E., S. B. M. Priceite and colemanite both occur in large quantities at the niter beds of this district, associated with carbonate and sulphate of soda.

Palma Lake. Borax mixed with natural soda has been discovered six miles from Twenty-nine Palms. The deposits cover large portions of Sec. 26, 29, 31, and 32, in T. 9 E., R. 2 N., S. B. M. The deposits are similar in many respects to the well known Searles Lake. Some

development work was done by Messrs. Johnson and Williams, of Riverside.

Pilot Beds. Borate deposits have been found at the south end of the Slate Range, southeast of Searles Lake. These deposits are mainly borate of lime in strata underlying the niter beds. No work has as yet been done to show their extent and value. The property is in the hands of W. R. Fales of Los Angeles.

Salt Springs. These are located in T. 18 N., R. 7 E., S. B. M., on the south fork of the Amargosa River. They form here a playa lake deposit of several hundred acres, similar to those already described at Coyote Holes, Owl Springs and elsewhere.

Saratoga Beds. These beds are located in T. 18 N., R. 5 E., S. B. M. They occupy the flats around Saratoga Springs at the foot of Funeral Range, in the bottom of the south end of Death Valley. Claims covering 5600 acres have been made on this portion of the bed of the ancient lake. The borax occurs around the springs and in the flat as a crust mixed with soda compounds. These crusts are from 1' to 3' deep, the richest borates being found in "pools" and "basins" varying from a few feet to several acres in extent, making the beds, as a whole, quite spotted as all of the borax deposits are. Rich portions are also found along the shallow river channels that wind everywhere through the flats. Samples taken have varied from 7% to 40% borax; from 10% to 60% sulphate of soda; from a trace to 5% carbonate of soda; from 8% to 25% chloride of soda, and from 10% to 50% insoluble matter. There is present also more or less magnesia and some iodine. Traces of boric acid were found in the Saratoga Springs, which are warm springs that issue with considerable force and in large volume from beneath the lavas. The overflow of these springs forms lakes that cover the greater portion of a section. It is probable that boring will reveal the presence of beds of borates and waters rich in borax.

Besides in the beds around the springs, borax in considerable quantities has been found in the niter fields three miles south, along the flank of the Avawatz range, and is described under the head of "Niter."

CEMENT.^a

Cement, as used in building, is a compound of lime, alumina and silica that hardens in contact with water. It differs from quicklime in that it does not slack, expand, crumble, nor give off heat when wet, but chemically combines with part of the water into a firm, artificial stone. There are two principal classes of cements—the natural rock or Rosendale cement, and the artificial product, or Portland cement, to which may be added a third—the Pozzuolana, or slag cement.

^aBulletin 38, pp. 171-172.

Natural Rock Cement.

A limestone which in nature contains sufficient clay or other aluminous material, mixed with carbonate of lime, so that it requires only burning and grinding to form a cement, is called a waterlime or natural cement rock, and the product is natural or Rosendale cement, sometimes called Roman cement. Natural cement rock was discovered in the United States near Chittenango, N. Y., in 1818. Later it was found in large quantities elsewhere in New York and in Pennsylvania, Indiana, Kentucky and other states. Ulster County, New York, and Louisville, Kentucky, were for a long time the centers of this important industry. Natural cement is generally inferior to Portland, and, in most places, its market has been taken by artificial product.

A natural cement rock is known in California near El Toro, Orange County, and claimed to be of good quality. Such a material was worked at one time at Benicia, in Solano County.

Portland Cement.

Portland cement is a compound consisting chiefly of silicates and aluminates of lime, produced by the calcination to incipient vitrification of a mechanical mixture of calcareous and argillaceous materials, the clinker thus produced being subsequently ground to a fine powder. Its chemical composition varies considerably, the principal constituents being lime, silica, alumina, and oxide of iron, which are apparently in the following proportions: lime, 60% to 64%; silica, 20% to 24%; alumina, 6% to 10%; iron oxide, 3% to 5%. These constituents, as a rule, amount to about 96%, the remainder consists of small quantities of sulphuric anhydride, magnesia, alkalies, etc.

The use of Portland cement is principally based on its characteristic quality of hardening rapidly under water or in a moist atmosphere.

Portland cement was first manufactured in England and so named in 1824 by Joseph Aspdin of Leeds, who patented a calcined mixture of limestone and clay. The name was based on a resemblance of the set cement to the famous Portland limestone used in building. The growth of the industry was at first slow. Not until 1851 was it brought prominently before the world, and soon after its manufacture began in Germany, France and elsewhere on the continent. The increase in output was rapid from this time, especially in Germany and England, which countries formerly exported large quantities to the United States.

Colton Cement Plant,⁴⁴ in Secs. 19 and 30, T. 1 S., R. 4 W., S. B. M. This is operated by the California Portland Cement Company, 401 American Bank Bldg., Los Angeles, Dan Murphy, president; T. J. Fleming, secretary and general manager; E. J. Strock, superintendent at the plant.

Preliminary work was begun about 1892 and in 1894 the works

⁴⁴Report XII, p. 380, 1894.

were producing about 50 barrels per day and employing 25 men.⁴⁵ In 1896 the capacity of the plant was 200 barrels per day, and 75 men were employed.⁴⁶ Since that time the capacity of the plant has been increased nearly three-fold.

The works are about $1\frac{1}{4}$ miles west of Colton, at the north end of Slover Mountain, south of the Southern Pacific Railroad. This mountain is a knoll of crystalline limestone, about a mile long, more than half a mile wide, and 500 feet high. Near its summit, on the northeast, is the quarry from which the rock was formerly obtained. Here the limestone is very coarsely crystalline, some of the calcite rhombs being more than one inch in diameter. Analyses of this stone show it to be very nearly pure carbonate of lime. One analysis gave:

Lime	55.216%
Carbon dioxide	43.384%
Silica	0.550%
Alumina and iron oxide.....	0.850%

The composition of the stone in the quarry is said to be remarkably uniform, as its appearance would indicate. A tunnel was driven through the mountain from the level of the quarry floor to a point directly above the old cement works, and the broken stone from the quarry was run through the tunnel on small tram cars and dumped into a rock crusher. After crushing it was sent by gravity down a long chute to the old cement mill now used only for making lime. The rock is finely pulverized in a Griffin mill, and then thoroughly mixed with clay in a mixer. The mixed product is fed into eight rotary kilns, where it is burned to clinker with an oil fire. A patent appliance which is used for spraying the oil into the furnaces is said to be a great aid in burning. The clinker from the kilns is spread out and sprinkled with water for the double purpose of cooling and seasoning it. It is then ground in Griffin mills and tube mills and sacked for shipment.

The clay is now obtained from Chester, Riverside County, a station on the Santa Fe Railway, east of Corona, and is shipped in by rail. The gypsum is shipped from Amboy, Cal. Besides cement, this company produces crushed stone, lime, and marble dust for making carbon dioxide gas for soda fountains.

Golden State Portland Cement Company: this company, formerly known as the Wyman Limestone Company, is incorporated under the laws of Arizona with officers as follows: F. O. Wyman, president; C. W. Russell, secretary; W. K. Watkins, superintendent; C. W. Green, foreman; J. J. Quint, head chemist; with offices at the works and also at 522 Marsh-Strong Bldg., Los Angeles. The plant is at Oro Grande (P. O. Halleck) and consists of an up-to-date and complete cement

⁴⁵Report XIII, p. 612, 1896.

⁴⁶Bulletin 38, p. 183.

plant where the limestone is ground, burned and the clinker ground into cement, the company employing about 60 men. The quarries are four miles east of the plant, the rock being transported from the quarries to the plant by a local railway owned by the cement company. The total area of land owned is 320 acres, and about 600 barrels of cement are made per day, the output to date amounting to 300,000 barrels. Electric power is generated by steam at 7 cents per h.p.-hour.

The Riverside Portland Cement Company: office, Mills Bldg., San Francisco, owns extensive undeveloped deposits of limestone, shales, and silica, said to be suitable for the manufacture of Portland cement in the vicinity of Oro Grande and Victorville, which will ultimately be worked when their Riverside deposits are exhausted.

Southwestern Portland Cement Company, C. Leonard, president; O. J. Benford, secretary; general office, H. W. Hellman Bldg., Los Angeles; L. D. Gilbert, engineer and general manager, Victorville, Cal.

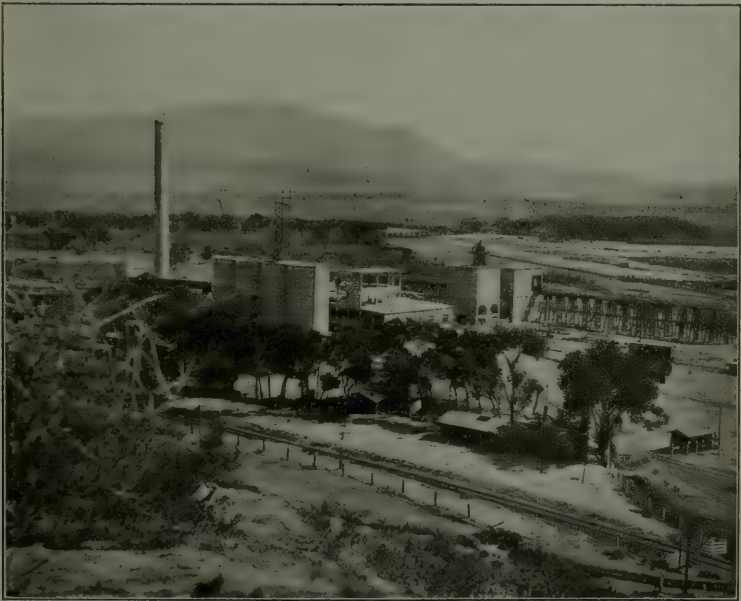


Photo No. 39. Plant of the Southwestern Portland Cement Co., 1 mile north of Victorville. The quarries are situated in the low mountains at right background. Santa Fe Railway seen in foreground.

This company owns a deposit of limestone, shales and silica covering about 250 acres six miles northeast of Victorville. A large modern cement plant is being constructed one mile north of Victorville and it is expected to begin manufacturing cement by September 1, 1916. The

plant is built entirely of reinforced concrete, and its capacity is to be, for the present, 300,000 barrels yearly. It is planned to double the capacity in the near future. One kiln 9' x 200' has been installed, and

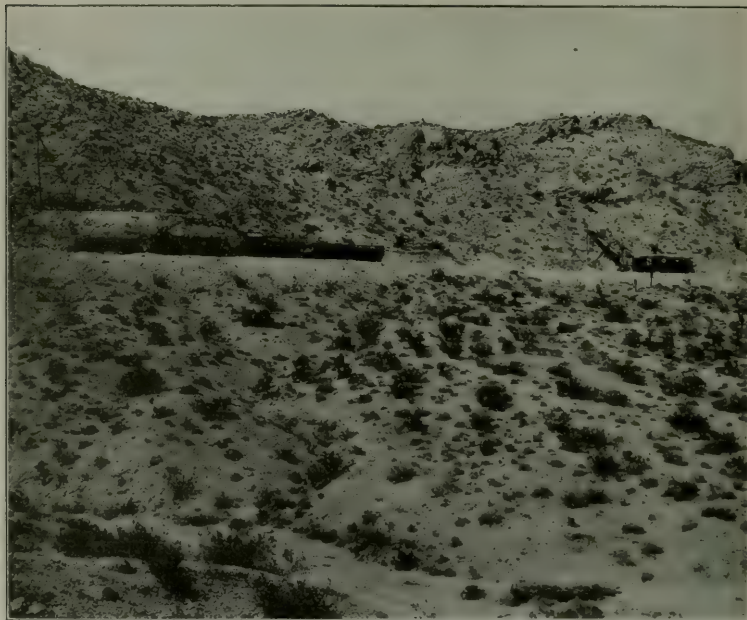


Photo No. 40. Southwestern Portland Cement Co.'s Quarry, 5.6 miles northeast of plant. Steam shovel is seen at right.

all the concrete work laid for a second one. The plant will be operated by electric power supplied by the Southern Sierras Power Company. Gypsum will be shipped to the plant from the Consolidated Pacific Cement Plaster Company at Amboy. A steam railroad, incorporated under the name Mojave Northern Railroad Co., has been built to haul the material from the quarries, 5.6 miles northeast, to the plant. The material is to be quarried by steam shovels. About 65 men will be employed upon the completion of the plant.

CLAY.

Brick Clay.⁴²

Taylor Bros. Brick Company. A. E. Taylor, manager, 1240 W. Olive Ave., Redlands. This company owns two clay deposits; one is in Redlands on West Olive avenue, about one mile west of the center of town and covers about five acres, of which about one acre has been worked out. The clay is from 3' to 5' deep and is underlaid by sand.

⁴²Bulletin 38, p. 253.

The material is a sandy loam. The bricks are made in a Potts soft-mud brick machine, air-dried, and burned in open kilns, using oil as fuel. The yard is equipped with an 80 h.p. boiler and a 35 h.p. engine. The capacity of the yard is 42,000 bricks per day, employing 23 men.

The other deposit is in San Bernardino, on G street, south of the Highlands branch of the Santa Fe Railway, and covers about 30 acres. The material is a sandy loam. The method of manufacturing the brick, the equipment and the capacity of the yard are similar to those of the Redlands brickyard.

Pottery Clays.

There are several known deposits of high grade clay in the county, most of which have never been developed, and all of which are now idle.

R. H. Atwood of Oro Grande owns a deposit of kaolin in T. 6 N., R. 4 W., S. B. M., 4 miles east of Oro Grande. A 100' drift has been run in the deposit. Idle.

Bibl.: Bulletin 38, p. 226.

C. F. Blackburn of Victorville has an undeveloped deposit of kaolin 6 miles east of Oro Grande, said to be about 40 ft. thick. Idle.

Bibl.: Bulletin 38, p. 226.

J. B. Friend, Victorville, formerly located a clay deposit in T. 6 N., R. 3 W., S. B. M., about 10 miles east of Victorville. This clay is said to be suitable for the manufacture of fire brick, pressed brick and tiles. Some was shipped to Tropico, Los Angeles County, in former years, but there has been no recent production.

Bibl.: Bulletin 38, p. 227.

G. J. Lingenfelder and **R. H. Grear**, Daggett, have located two claims, Kaolin No. 1 and No. 2, on a bed of clay, 12 miles northeast of Barstow. The clay bed is several feet thick, and is exposed for 3000 feet along the strike. It is gray in color and very hard. It underlies a bed of rhyolite tuff, 8" to 2½' thick, which has been partially kaolinized. Undeveloped.

M. Mulcahy and **Mrs. M. Falconer**, Daggett, own a deposit of clay in the Calico district 6 miles by road north of Daggett and 5 miles west of Yermo, a station on the Salt Lake Route. The clay bed is from 2' to 3' thick, exposed along a ravine below the old Silver King mine in folded sediments (*see* Photo No. 41). The clay is gray in color, hard, and appears to be very uniform in character. No development work has been done at this property.

Velvet White Filler Company, 825 Los Angeles Investment Bldg., Los Angeles; A. L. Beardsley, president; A. B. Clark, secretary. This company owns a deposit of "whiting" in the Silver Mountain district, 3½ miles east of Oro Grande. The deposit consists of seams of white silica, talc and kaolin in an igneous formation. A plant was built at

Bryman Siding for treating this whiting. The process is briefly as follows: It is washed in tanks, and an inverted screw separates the clay from sand, the clay floats into settling tanks, then into presses.



Photo No. 41. Clay beds exposed in Tertiary sediment at Calico, on claim of M. Mulcahy et al.

It is subsequently dried by steam heated dryers, reground and sacked. It is used for paint filler, sizing paper, and some porcelain work. This property has been idle for sometime, but it is reported that it is to be reopened shortly.

DOLOMITE.

Joseph Scheerer of Victorville has a deposit of dolomite on his claims east of Oro Grande. (*See* under Limestone.)

FELDSPAR.

J. H. Sloan, Barstow, made shipments of several carloads of feldspar during 1916 from a quarry which he has opened up near Hinkley. He also reports a body of strontium ore nearby. From the following

analysis of the feldspar made by Smith, Emery & Co., it is probably *anorthoclase*:

Analysis of Sloan Feldspar.

Silica (SiO_2)	74.84%
Alumina (Al_2O_3)	14.71%
Iron oxide (Fe_2O_3)	1.13%
Lime (CaO)	0.96%
Magnesia (MgO)	1.00%
Potash (K_2O)	3.00%
Soda (Na_2O)	by difference 4.36%
Total	100.00%

FLUORSPAR.

L. A. Davis, Stagg, post office (Ludlow)—see under Barytes.

FULLER'S EARTH.

J. Reed,⁴⁸ 428 Court St., San Bernardino, owns a deposit containing fuller's earth, claimed to be of considerable extent, about 12 miles north of Barstow. The fuller's earth occurs in sandstone and conglomerate. It is gray, red and brown in color.

W. E. Van Slyke,⁴⁸ 716 Fifth St., San Bernardino, has located a deposit of fuller's earth, claimed to be of considerable extent, in the northern part of T. 9 N., R. 22 E., S. B. M., on the north side of the Sacramento Wash, opposite Java, a station on the Santa Fe Railway. About 1902 some work was done on this deposit, showing a face over 80 ft. long.

Wm. B. Werner, 2378 West Twenty-first St., Los Angeles., has recently located two deposits of fuller's earth in the vicinity of Daggett, one gray in color, the other white. They are both said to be very pure and the deposits extensive.

GEMS.

Agate or Chalcedony.

F. M. Myrick of Randsburg has a fine deposit of blue agate or chalcedony, 37 miles east of Johannesburg and about 2 miles northeast of Lead Pipe Spring. Quoting from the report of Douglas B. Sterrett⁴⁹: "The blue chalcedony occurs as fillings in joints, fractures and vesicular cavities in rhyolite, forming veins and irregular masses. Much of it is very delicately banded, showing straight, curved or angularly bent layers. In some specimens the agate passes into crystal quartz, lining or filling geode cavities.

"Agate containing bright red inclusions found 45 miles northeast of Johannesburg and 15 miles northeast of Lead Pipe Spring was discovered by Mr. Myrick, after whom it was locally called 'Myrickite'."

Some of this myrickite was polished and cut for jewelry, but there has been no work on these deposits recently.

⁴⁸Bulletin 38, p. 275.

⁴⁹U. S. G. S., Min. Resources 1913, Part II, p. 650.

A deposit of **Bloodstone** and **Jasper** was found in the vicinity of the myrickite and many cut gems from this deposit were sold in southern California. There has been no recent production.

Opals have been found in several localities on the Mojave Desert, but not in sufficient sizes and quality to warrant mining operations.

Bibl.: Bulletin 37, pp. 76, 77, U. S. G. S. Min. Resources 1911, Part II, p. 1059; 1913, Part II, pp. 675, 676.

Lapis Lazuli.

A small deposit of this mineral occurs in the NE. $\frac{1}{4}$, Sec. 6, T. 1 N., R. 7 W., S. B. M., and was described at length by Mr. Gordon Surr⁵⁰ of San Bernardino, from whose report this description is taken. The locality is on the north slope of the south fork of Cascade Cañon, $1\frac{1}{2}$ miles south of east of the "Hogback," a well-known landmark in San Antonio Cañon, to which Cascade Cañon is tributary.

The "blue rock" lazurite) was thought by prospectors to carry silver and the deposit was opened with this idea. A pit 15' deep apparently went through the "blue rock" and it was abandoned. No lapis lazuli was found in place, but about 150 lbs. of loose rock with some of the blue intermixed were found in the talus on the slope and in the drift in the stream bed. The country rock consists chiefly of quartzites and limestones. The lapis lazuli was apparently found in a layer of dark quartzite. It is not of good quality being mixed with a number of other minerals and is of no commercial importance. Specimens are on exhibition in the museum of the State Mining Bureau, and in the Chamber of Mines and Oil at Los Angeles.

An occurrence of **Lazulite** is reported in Breyfogle Cañon. The lazulite occurs in a vein cutting schist. The vein is said to vary from 1" to 5' in thickness and can be traced several miles. Some pretty specimens have been cut into gems that are unusual and very attractive. This has erroneously been called "lapis lazuli," but it is of different chemical composition.

Bibl. U. S. G. S. Min. Resources 1911, Part II, p. 1060.

Turquoise.

The following description is quoted from the report of Dr. George F. Kunz,⁵¹ who made a thorough investigation of the gems and ornamental stones of California:

"In the extreme northeastern part of this county have been discovered old and abandoned mines of turquoise covering an area of many square miles. Associated with these mines were found the relics of an early race; and it is supposed that this is the original source of much of the turquoise found in the hands of the Indians of the southwestern United States and Mexico. The turquoise occurs in small veins and also in

⁵⁰Mining & Engineering World, Dec. 27, 1913.

⁵¹Bulletin 37, pp. 107 *et seq.*

kidney-shaped masses about the size of a bean. Much of it is of good quality.

"The first published announcement of turquoise discoveries in this region was made through the writer in 1897 in his report to the United States Geological Survey.⁵² The locality was given as near Manvel. Mr. T. C. Bassett had observed in this neighborhood a small hillock where the float rock was seamed and stained with blue. On digging down a few feet, he found a vein of turquoise, a white talcose material inclosing nodules and small masses of the mineral, which, at a depth of 20 feet, showed fine gem color. Two aboriginal stone hammers were met with, as is usual at all the turquoise localities in the southwest, and from this circumstance the location was named Stone Hammer mine.

"The State Mining Bureau reported about the same time that turquoise had been found in the desert region between Death Valley and Goff's Mining District, nearer the former, and that good samples were in the museum of the Bureau.

"In the spring of 1898 many reports of extensive discoveries were announced and much attention was given by the press to the accounts of the region, both for the turquoise itself and for the remarkable archeological remains associated with the ancient workings. The district was seen to cover quite a large area in northeastern San Bernardino County, near the Arizona and Nevada lines.

"On the reports of prospectors reaching San Francisco as to a great group of ancient turquoise mines with cave dwellings, stone implements and rocks covered with inscriptions an exploring party was organized by the San Francisco 'Call' and Mr. Gustav Eisen of the California Academy of Sciences became attached to it as archæological expert.⁵³ The party set out early in March, 1898, going first to Blake Station on the Santa Fe Railroad, thence north to Manvel, and onward some 60 miles across the Ivanpah Sink, and up into the mountains to an altitude of over 6000 feet through an exceedingly rugged country to reach the region reported. The turquoise district, as described by Mr. Eisen and others of the party, occupies an area of 30 or 40 miles in extent, but the best mines are in a smaller section, about 15 miles long by 3 or 4 in width. The region is conspicuously volcanic in aspect, being largely covered with outflows of trap or basaltic rock reaching outward from a central group of extinct craters. These flows extend for many miles in all directions, and appear as long, low ridges, separated by valleys and cañons of the wildest character. Among these basaltic rocks and in the valleys are found smaller areas of low, rounded hills of decomposed sandstones and porphyries, traversed at times by ledges of harder crystalline rocks, quartzites and schists. In the cañons and in the sides

⁵²Min. Res. U. S., 1897, p. 504.

⁵³U. S. G. S., 20th Rept. Min. Res. 1898, pp. 582-584, and San Francisco "Call," March 18, 1898.

of the hills are the old turquoise mines, appearing as saucer-like pits, from 15' to 30' across and of half that depth, but generally much filled up with debris. They are scattered about everywhere. Around them the ground consists of disintegrated quartz rock, like sand or gravel, full of fragments and little nodules of turquoise. Whenever the quartzite ledges outcrop distinctly they show the blue veins of turquoise, sometimes in narrow seams, sometimes in nodules or in pockets. The mode of occurrence appears closely to resemble that at Turquoise Mountain, Arizona. A few prospectors have dug into the old, half-filled depressions and found stones of good color and quality, and ordinary ones may be picked up almost anywhere out of the decomposed quartz. Stone tools are abundant in the old workings, and the indications are plain that this locality was exploited on a great scale and probably for a long period, and must have been an important source of the turquoise used among the ancient Mexicans. From an archaeological point of view this locality possesses remarkable interest. The cañon walls are full of caverns, now filled up to a depth of several feet with apparently wind-blown sand and dust, but whose blackened roofs and rudely sculptured walls indicate that they were occupied for a long time by the people who worked the mines. In the blown sand were found stone instruments and pottery fragments of rude type, incised but not painted. The openings to these caves are partially closed by roughly built walls composed of trap blocks piled upon one another with no attempt at fitting and no cement, but evidently made as a mere rude protection against weather and wild beasts. The tools, found partly in the caves and largely in the mine pits, are carefully wrought and polished from hard basalt or trap, chiefly hammers and adzes or axes, generally grooved for a handle and often of large size. Some are beautifully perfect and others much worn and battered by use.

"The most impressive feature, however, is the abundance of rock carvings in the whole region. These are very varied, conspicuous and peculiar, while elsewhere they are very rare. Some are recognizable as 'Aztec water signs,' pointing the way to springs; but most of them are unlike any others known, and furnish a most interesting problem to American archaeologists. They are numbered by many thousands, carved in the hard basalt of the cliffs, or, more frequently, on large blocks of the same rock that have fallen and lie on the sides of the valleys. Some are combinations of lines, dots, and curves into various devices; others represent animals and men; a third and very peculiar type is that of the 'shield figures,' in which complex patterns of lines, circles, cross hatchings, etc., are inscribed within a shield-like outline perhaps 3 or 4 feet high. One curious legend still exists among the neighboring Indians that is in no way improbable or inconsistent with the facts. The story was told Mr. Eisen by 'Indian Johnny,' son of

the Piute chief, Tecopah, who died recently at a great age and who, in turn, had received it from his father. Thousands of years ago, says the tale, this region was the home of Desert Mojaves. Among them suddenly appeared from the west or south a strange tribe searching for precious stones among the rocks, who made friends with the Mojaves, learned about these mines, and worked them and got great quantities of stones. These people were unlike any other Indians, with lighter complexions and hair, very peaceable and industrious and possessed of many curious arts. They made these rock carvings and taught the Mojaves the same things. This alarmed and excited the Piutes, who distrusted such strange novelties, and thought them some form of insanity or 'bad medicine' and resolved on a war of extermination. After a long and desperate conflict, most of the strangers and Mojaves were slain, since which time, perhaps a thousand years ago, the mines have been abandoned. Mr. Eisen connects this account with the existence of a fair and reddish-haired tribe, the Mayos (not Mayas), in parts of Sinaloa and Sonora, some of whom may have reached these mines and carried on a turquoise trade with Mexico. This region has since been opened at several points, and at least a dozen mines, worked by various parties, mostly with Eastern capital." The principal work was done by the Himalaya and the Toltec mining companies, both of which are now idle. The turquoise obtained, when pure and of good color, was cut into fine gems, also the white and blue combination known as turquoise matrix, when small portions and veins of turquoise are distributed through the rock, the whole being cut and polished as an ornamental stone. The paler varieties of turquoise were cut into beads, etc., long strings of which were sold. Most of the material produced was sent to New York. The yield in 1900 was estimated at a value of \$20,000.

Himalaya Mining Company. This company has operated turquoise mines in San Bernardino County. They were owned by Mr. L. Tannenbaum of New York and are situated in the Solo Mining District about 30 miles northwest of Cima and the same distance east of Silver Lake on the Tonopah and Tidewater Railroad. There are five claims in this group, all on the same ledge, which consists of a bird's-eye porphyry with some granite, with a N.-S. strike, and dip 75° W. The pockets of turquoise, which is practically the only gem found, lie in this porphyry surrounded by a friable mass of so-called silicate of lime. The shafts 80 feet in depth have been sunk on the property, but 40 feet was the lowest level at which gem turquoise was found. From this level the mine has been practically stoped to the surface. There is no timber at the mine, but some small pine can be secured 10 miles north. Water was found by sinking a well 85 feet; it could be used for drinking, but was of very inferior quality. Work was done by screening and washing, entirely by hand, there being no machinery of any kind on the prop-

erty. Other improvements were bunk houses, etc. The mine was closed down on the first day of March, 1903, and no work of any account has been done since that date. For the two months during which the mine was worked in that year, six men were employed, at an average wage of \$2.50 per day. The expense of mining was very high—about \$20.00 per foot. Giant powder was used exclusively, and it required about 10½ pounds to the foot.

The shipments that year (January and February, 1903) as given by the Wells-Fargo agent amounted to 431 pounds of matrix and ordinary turquoise and 49 pounds of picked material.

Toltec Gem Mining Company. The California property of this company consists of three groups of mines situated in San Bernardino County on the desert about 30 miles northwest of Cima on the Salt Lake Route, and about 50 miles west from South Ivanpah which is the terminus of a branch of the Santa Fe Railroad from Goffs. The altitude is between 5000' and 6000', and there being no water at either of the camps, it is necessary to haul it over the mountains from 1 to 5 miles. These camps are about 6 miles apart and are known as East Camp, Middle Camp and West Camp in the old Solo Mining district. Death Valley is within 20 miles of West Camp. These mines are all patented. The qualities of the turquoise taken from these various camps vary widely, from quite soft to very hard. The same company also has turquoise mines in Nevada, 60 miles due east of these. Here stone hammers were met with at a depth of 18 feet. Scarcely any turquoise was found much below 100 feet from the surface, and a 200-foot shaft failed to reveal any at all. This fact, which is also reported from the mines of the Himalaya Company, is a curious one, indicating that the turquoise must be in some way a product of rather superficial alteration. The mines of both these companies have been quite large producers. The Toltec Company obtained one gem-stone of rather a pale blue, that cut into a perfect oval measuring 32 by 45 millimeters, and weighing 203 carats.

GRAPHITE.

A deposit of graphite is said to occur near the head of the Santa Ana River in the San Bernardino Mountains, about 15 miles from East Highlands, a station on the Santa Fe Railroad. It is undeveloped. Owner, W. E. Van Slyke, 716 Fifth St., San Bernardino.

Bibl. Bulletin 38, p. 280.

GYPSUM.

San Bernardino County contains gypsum deposits in many places on the desert, the most notable, and at present the only one worked, being that of the Consolidated Pacific Cement Plaster Company in the Amboy sink. A similar deposit is said to exist at Danby dry lake, 32 miles southeast of Danby station on the Santa Fe railway.

Gypsum occurs also in thin-bedded deposits associated with the beds of rock salt in the Avawatz Mountains and to a lesser extent in the



Photo No. 42. Mining gypsum with plow and scraper at dry lake deposit of the Pacific Consolidated Cement Plaster Co., near Amboy, Cal.

borax beds of the Calico district. A deposit was located some years ago near Camp Cady on the Salt Lake Route but very little work was done on it.

Bibl. Bulletin 38, p. 287; U. S. G. S. Bulletin 413, pp. 25-28.

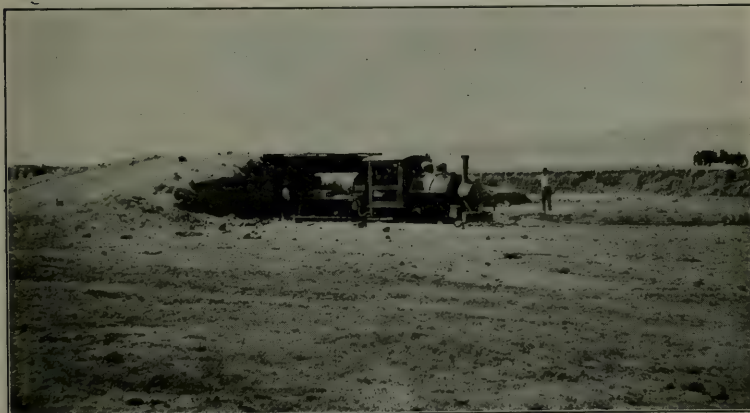


Photo No. 43. Steam engine used to haul gypsum to the plant of the Pacific Consolidated Cement Plaster Co. at Amboy, Cal.

Consolidated Pacific Cement Plaster Company, office, 612 San Fernando Bldg., Los Angeles; J. D. Bowersock, president; D. A. Mulvane, secretary. This company, formerly known as the Pacific Cement Plaster Co., has been working the Amboy dry lake deposit 2 miles southeast of Amboy for the past ten years. This lake bed is very extensive,

covering several thousand acres, and is of a type common to the Mojave Desert. The gypsum occurs loosely cemented with sand in coarse crystals up to $\frac{1}{4}$ " across, deposited in a bed varying from 4' to 6' in



Photo No. 44. Plant of the Pacific Consolidated Cement Plaster Company at Amboy, Cal.

thickness covered with a thin sandy soil. The surface is stripped by horse scrapers to a depth of about 1' and the gypsum is then plowed down and scraped up to a platform (see photo No. 43) through which it is dumped into tram cars below. The cars are drawn by a small steam locomotive, hauling 20 tons to a trip, to the company's mill at Amboy, where it is crushed, washed, and calcined. Both hard (wall) plaster and cement plaster are manufactured, the latter being shipped to the cement plants of southern California at Riverside, Colton, Oro Grande and Victorville. Power to operate the mill is supplied by a 400 h.p. Corliss, cross-compound, condensing, steam engine. Crude oil is used for fuel. Water is brought from the Santa Fe Railway Company. At the present time the company is working only one shift, producing approximately 100 tons daily. Thirty men are employed. Mexican labor is used at the quarry. F. E. Towne Jr., is manager at the property.

M. Mulcahy et al. of Daggett have two gypsum claims in the Calico District, $2\frac{1}{2}$ miles west of Yermo on the Salt Lake Route. The gypsum occurs in an impure bed varying from 2' to 4' in width, associated with the borax beds in the Tertiary sediments of the Calico Range. Very little work has been done on this deposit and it is at present of no commercial importance.

INFUSORIAL EARTH.

A small deposit of infusorial earth is claimed to occur in the northern part of T. 2 N., R. 9 E., S. B. M., about 12 miles from Twenty-nine Palms, and 40 miles from Palms Station. It is stated to be about 2 feet thick. This is on unappropriated government land.

Bibl.: Bulletin 38, p. 292.

LIME AND LIMESTONE.

Limestone deposits of great commercial value occur in several localities in San Bernardino County, the most important ones being those at Baxter, Colton and Oro Grande, described below.

The limestone produced in this county is used principally to make lime. This material is produced by burning or calcining limestone, thereby driving off the carbon dioxide and leaving calcium oxide or lime.

The lime burned at Colton and Oro Grande is principally used in the manufacture of cement. The Baxter limestone is shipped to the sugar factories of the south, where it is used to burn lime for the manufacture of beet sugar. As the beet sugar industry is rapidly increasing, there is a constant demand for a high grade limestone for this purpose. Lime is also used for mortar and plaster in building operations, as a furnace flux, as a fertilizer, in glass manufacture, and many other minor industries.

Bibl.: Bulletin 38, pp. 61-64.

How Beet Sugar Is Made. The following description of the manufacture of beet sugar is here interpolated because the Baxter District is the most productive limestone district in San Bernardino County, and the sugar refineries of California furnish an important market for limestone.

First the beets are hauled to the factory by the farmers, or, as in the case of the American Beet Sugar Company, are cultivated by the company, and deposited in large roofed bins with V-shaped bottoms, which are connected with the factory by various mechanical devices, through which a moderate flow of water carries the beets into the first washing machine. By patented mechanical devices the beets are stirred about and washed until thoroughly cleaned, then by conveyor are carried to the roof of the plant, where they pass through an automatic weigher and slicer, and are sliced in such a manner as to open up the cells of the beet as far as possible. The sugar beet is cellular in structure, and in its minute cells is enclosed the saccharine fluid, so that in slicing it is desirable to open as many of them as possible, and in such a way as to make a clean cut without rupturing the cells. The beets next drift into a diffusion battery, where the sugar is extracted by soaking the sliced beets in water. The mass of sliced beets is termed

"cosettes." They are next placed in a tank with warm water, which passes out at the bottom and into the next tank, and from one to another until fourteen tanks or cells have been used. The water is now drawn off and tank number two becomes number one, and number one is emptied of its "cosettes" and refilled, becoming number fourteen, and so the cycle is continued, extracting in this way all of the sugar from the "cosettes" in a solution which now has the color of ordinary vinegar. The liquid is then taken to a measuring tank, near by, from which it goes to a mixer, where it is mixed with lime produced in kilns at the works and then transferred to a large tank for carbonation; in this the lime and some other foreign matter that it contains is rendered insoluble by means of carbon dioxide gas collected from the kilns and forced through the bottom of the carbonating tank. Then the liquid goes through the filter press rooms, where by means of an elaborate series of frames it is filtered and becomes clear. When this process is finished for the second time, the syrup is treated with sulphur fumes and then passes into the "quadruple effect" (four large boilers in which most of the water contained is evaporated), the remainder being termed "thick juice." This syrup is boiled in a vacuum pan and its content becomes raw sugar, which is then further cleaned of its molasses by other machines known as centrifugals. The sugar is now damp like wet snow, and by means of a granulator it is dried; and by means of sieves it is separated into the finer or coarser grades ready for market.

Baxter Deposits.

Baxter and Ballardie Quarries comprise four claims totaling 118.62 acres in the S. $\frac{1}{2}$ of Sec. 12, T. 11 N., R. 6 E., S. B. M., and are owned by D. F. and D. A. Baxter and A. W. Ballardie of 915 Union Oil Bldg., Los Angeles. These claims, known as the White Marble No. 1, No. 2, No. 3, and Evening Star, join the Mojave River at a point near Baxter Station, on the Salt Lake Route, 197 miles east of Los Angeles. They cover outcroppings for a distance of about 4500 ft., ranging from 400' to 800' in width and from the level of the desert (1380') to a height of 600'. The hills are almost free of soil, the only overburden being a talus of broken limestone on the north side, which slopes at an angle of about 20°; the south fissures are very precipitous in places and have bunches of talus at the base which afford good sites for quarrying operations. The limestone is broadly stratified and varies slightly in color and texture. That nearest the railroad siding, or the south exposure of Marble Placer No. 1 (*see* Plate IV) is of a salmon pink or flesh color. This type constitutes 75% of the deposit. Near the center of the hill, forming as it were the backbone of the formation, is a strip of blue limestone of about 10' to 20' in thickness, constituting roughly

10%. There are some beds of pure white, dense, close-grained metamorphosed limestone or marble well adapted for ornamental or building purposes (*see* Photo No. 46). Analysis of a sample of the limestone from the quarry of the Sugar Lime Rock Company showed as follows:

H ₂ O	0.21%
SiO ₂	2.24%
Fe ₂ O ₃ Al ₂ O ₃	0.53%
CaCO ₃	97.93%
MgCO ₃	.54%
CaSO ₄	.15%
Total	101.60%

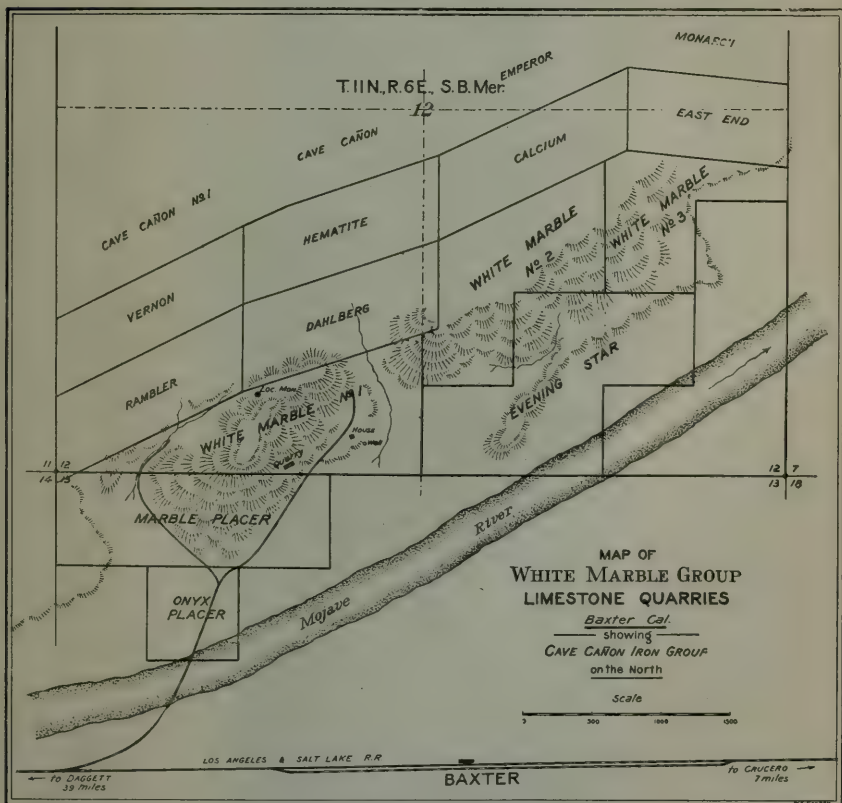


PLATE IV.

A portion of this deposit is under lease to the **Sugar Lime Rock Company**, whose officers are: A. R. Peck, president, Trust and Savings Bldg., Los Angeles, and Henry C. Lee, secretary, 522 Pacific Electric Bldg., Los Angeles. Ben C. Brock is superintendent at the

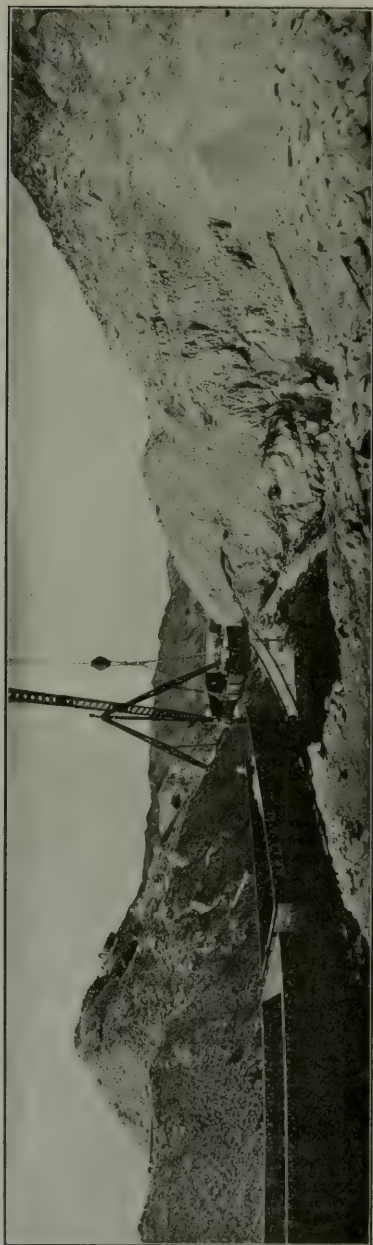


Photo No. 45. White Marble Claim No. 1, showing large dumps of undersize limestone at left which is sold for flux and plaster. Baxter and Ballardie Limestone Quarries at Baxter, Cal. Photo by courtesy of D. F. Baxter.

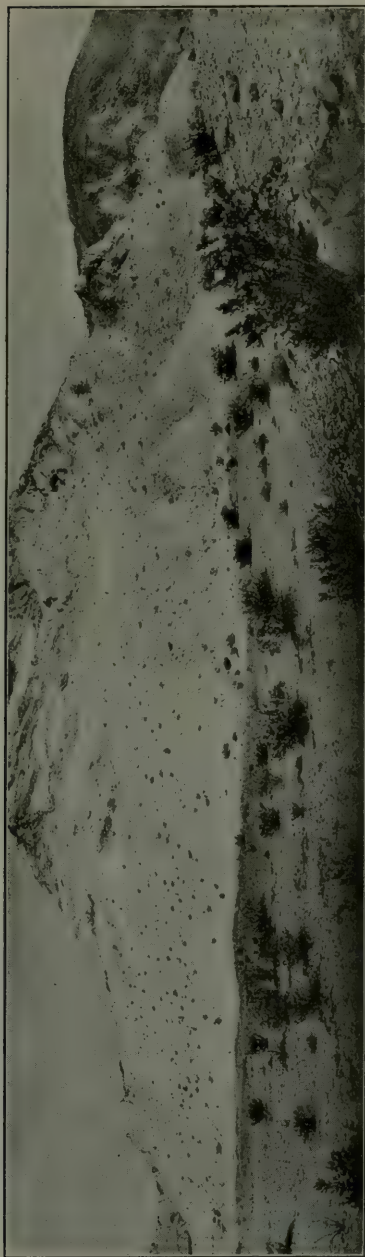


Photo No. 46. White Marble Claim No. 2, showing large undeveloped deposit of white marble suitable for building or decorative purposes. Baxter and Ballardie Limestone Quarries at Baxter, Cal. Photo by courtesy of D. F. Baxter.

quarry, and about 50 laborers and 10 mechanics are employed. This company has a spur track from Baxter to the White Marble No. 1 claim, where most of the quarrying is now being done and the limestone is shipped to the sugar beet factories at Oxnard, Santa Ana, Huntington Beach, Los Alamitos, Anaheim and Chino. The equipment consists of one 110-ft. steel boom derrick, 35 h.p. Fairbanks-Morse gas engine, a pumping plant of 30 gallons per minute and storage capacity of 15,000 gallons; nine $1\frac{1}{2}$ cu. yards dump cars, machine drills and compressor, several thousand feet of track, and all the necessary bunk and boarding houses for the crew.

West and south of the White Marble Group, in Sec. 13, is a quarry owned by the **Southern Pacific Railroad Company**, also operated by the Sugar Lime Rock Company. This is a continuation of the White Marble deposit, and is known as the Marble Placer Claim (see Plate IV). The Sugar Lime Rock Company is shipping about 65,000 tons of limestone annually to the several sugar factories and has been operating since 1914.

Colton Deposits.

California Portland Cement Company, 401 American Bank Bldg., Los Angeles. This company owns Slover Mountain, $\frac{1}{2}$ mile southwest of Colton, in Secs. 19 and 30, T. 1 S., R. 4 W., S. B. M., which is an isolated knoll of crystalline limestone about 500 ft. high. Quoting from Bulletin No. 38, p. 77: "The limestone is generally very pure, especially the coarser crystalline variety, which runs 98½% to 99% calcium carbonate. The lime burned from this limestone slakes very quickly and flashy, but must be slaked with a great amount of water to prevent it from being burned. The fine-grained limestone is not so pure, but makes a better plaster."

The lime is burned during only a part of the year, employing 8 to 10 men. T. J. Fleming is general manager.

(See also under Cement and Marble.)

A small deposit of white, coarsely crystalline limestone occurs $3\frac{1}{2}$ miles southwest of Slover Mountain in Sec. 33, T. 1 S., R. 5 W., S. B. M. It was formerly quarried and burned in a small kiln on the Santa Ana River, but is now idle. Owners, Mrs. O. Burns, San Bernardino, and Rev. P. J. Stockman of Santa Barbara.

Bibl.: Bulletin 38, p. 77.

Oro Grande Deposits.⁴⁴

The limestones here are interstratified with reddish brown quartzite and brown shale. In the quarries the limestone varies from 60' to 200' in thickness, but the total thickness or total extent of the limestones in this region is not known. In the area surrounding the quarries are

⁴⁴Bulletin 38, p. 77.



Photo No. 47. The Pit Quarry on White Marble No. 1, showing method of quarrying the Baxter and Ballardie limestone deposits at Baxter, Cal.
Photo by courtesy of D. F. Baxter.

isolated outcrops of smaller lenticular masses of limestone. About 3 miles east of Victorville is another outcrop of massive crystalline white and clouded limestone that would make a handsome marble.

The limestone is hard and coarsely crystalline, mostly dark blue in color, with numerous iron stains, but, in the large quarry nearest the railway, there is much white limestone with dendrites along the surface in the joint and cleavage planes.

At several places in the upper quarries there are great clusters of calcite and aragonite crystals, which occur in prisms, sometimes 4 or 5 inches long, and stained brownish yellow by the iron oxide. There is also considerable pyrite and in some places bornite, along the joints, the weathering of which gives rise to free sulphur in a number of places and in others to stains of yellow-brown iron rust. The impurities are not in sufficient quantity to materially injure the quicklime, but they are sufficient to disfigure the rock for use as a building stone.

The rock is so much fractured that no large dimension stone is available, but this condition is an aid in lime quarrying as the stone is used in small dimensions and must be broken up artificially if not already broken by nature. The quarrying is done by hand-drilling and blasting.

The quarries are located well up on the hillside, east of the railway, and northeast of Oro Grande Station, near the middle of T. 6 N., R. 4 W. The road to the railroad is down grade, part of it very steep. Some of the lime kilns are located on the railway, several north and one south of Oro Grande Station, and two of the kilns are on the hillside half a mile east of the railway. The stone is hauled by wagons from the quarries to the kilns.

Hoey Quarry: This was formerly operated for the American Beet Sugar Company at Oxnard, but has been idle for some years.

Oro Grande Lime and Stone Company, P. C. Thompson, manager, 408 Stimson Bldg., Los Angeles. This company owns a quarry in Sec. 9, T. 6 N., R. 4 W., $3\frac{1}{2}$ miles east of Oro Grande, which was formerly operated for the American Beet Sugar Company, but is now idle.

Scheerer Limestone Deposits. These deposits are near Victorville and have been owned for some years by Joseph Scheerer of Victorville. He has recently sold portions of these deposits to the Southwestern Cement Company and to T. Henshaw for the Riverside Portland Cement Company. The first named company is now building a 5000-barrel per day plant out of Victorville and has a spur track connecting it with the quarry. Scheerer still retains other extensive limestone deposits in Secs. 23 and 24, T. 6 N., R. 4 W., S. B. M., $3\frac{1}{2}$ miles northeast of Victorville and near both the Santa Fe and Salt Lake railroads. There is a good wagon road to the property; and the

best quarry sites are easily accessible by about a 2% grade from a spur track which can be run from a point on the right bank of the Mojave River about 3 miles below Victorville, a distance of 4 miles. The deposit forms a series of sharp and round-topped hills, rising abruptly on the west, and sloping off more gradually to the east, with the limestone resting on and against granite. (See also under Granite.)

Analyses of the limestone by Smith, Emery & Co., San Francisco, show 93.3% to 99.2% CaCO_3 , a trace to 1.3% MgO , and variable amounts of silica from a trace to 5.8%. Besides this high-grade limestone, there are also deposits of dolomite, suitable for marble.

Scheerer also has limestone deposits in Secs. 27, 28, 32, 33, T. 10 N., R. 2 W., S. B. M., 2 miles west of Barstow and adjoining the old Waterman silver mine. They are $\frac{1}{2}$ mile from the railroad, and the limestone is high-grade, being suitable for lime, cement or sugar making.

Superior Limestone Quarry, owned by the American Beet Sugar Company, adjoins the Oro Grande Lime and Stone Company's quarry in Secs. 9-16, T. 6 N., R. 4 W. Limestone from this quarry was shipped to the sugar beet factories at Oxnard and Chino for several years previous to 1914, since which time the quarry has been idle.

Other Deposits. A large deposit of limestone said to be very pure is being quarried near Cajon, on the Santa Fe railroad, by the **Big Pines Lime and Transportation Company**, with offices at 1129 Merchants National Bank Bldg., Los Angeles. This company has recently contracted for a large production. Ten men are employed. W. J. Hunter is engineer in charge of the property.

Maurice Mulcahy and **J. C. McMillan**, Daggett, Cal., own a deposit of limestone in the vicinity of Daggett, 4 miles south of Gale Siding on the Santa Fe Railway. The limestone is white, rather coarsely crystalline, and is almost pure calcium carbonate. It is said to outcrop for 400' along the strike in beds varying from 35' to 80' in width. Undeveloped.

MARBLE.

Nearly all the limestone found in San Bernardino County may be classified as marble, but in recent years very little has been quarried for building or monument purposes. It is mostly used for burning lime. (See under Limestone.) Most of the marble produced in the county for building or ornamental purposes was from the quarries on Slover Mountain near Colton, operated by the California Portland Cement Company. In his report on Slover Mountain, W. A. Good-year⁵⁵ wrote as follows:

"It consists chiefly of limestone, which, however, varies greatly in character. Some of it is very fine-grained and pure white, and could

⁵⁵Report VIII, p. 504.

it be obtained in sound, unspotted blocks of uniform texture and sufficient size, it would make a fine statuary marble. But much of it is very coarsely crystalline often showing cleavage planes half an inch or more in diameter; yet even of this coarse rock much is very compact, takes a fine polish, and makes a handsome marble. Some of it contains graphite scattered through in streaks and spots, and some of it contains micaceous hematite. Some of it also contains a good deal of silica, and therefore would not make good lime.

"Aragonite (wrongly called 'onyx') also occurs here in veins and bunches, delicately and beautifully striped and banded with various shades of yellow and brown, as some agates are. If, as seems possible, it can be obtained in slabs of sufficient size, it will make extremely handsome mantel-pieces, table tops, etc.

"In the north end of the hill the rock strikes about N. 70° E., magnetic, and dips 45° SE. But in a large part of the hill the metamorphism has gone far enough to greatly obscure and, in places, entirely obliterate the stratification. A mill was long ago built here for sawing, cutting, and polishing the marble, which was used to a considerable extent for building and ornamental purposes in San Bernardino and elsewhere. A good deal of lime has also been burned at various points around the foot of the hill. But a mile or two away on the opposite or south side of the Santa Ana River all the hills are of granite."

Baxter and Ballardie Quarry. (*see* under Limestone). There is a deposit of crystallized white and yellowish white limestone at this property which takes a fine polish and would make a very attractive building stone. None has been quarried as yet for this purpose.

California Portland Cement Company, 401 American Bank Building, Los Angeles, owns the following quarries on Slover Mountain near Colton:⁶⁰

1. Colton Cement Works Quarry. (*See* under Cement.)
2. Crusher Plant Quarry, on the northwest corner of the mountain about 200 yards from the cement works. The limestone is similar to that in the quarry of the Colton Cement Works, but the inclusions of hornblende are larger. The rock is crushed in a spindle crusher to a size of about 2 inches in diameter and is used for concrete.
3. Marble Dust Quarry and Plant, on the west side of the mountain. The limestone is purer without inclusions of the hornblendic material. The rock is broken down by hand in the quarry, then crushed in a Potts crusher to $\frac{1}{2}$ " in size; next it passes through a 30" Sturtevant mill and then through 4 screens. The grit is used for coating tarred roofing paper; the finer material passes through a 36" Sturtevant mill, where it is ground to impalpable dust. This material is used in a mixture with asphalt for street paving.

⁶⁰Bulletin 38, pp. 102-104.

4. The Colton Marble Works, formerly operated by the Colton Marble Company, were shut down in 1910. They were on the south side of Slover Mountain, and used marble from two quarries. The lower quarry, about 30 feet above the works, was the larger. The dark-bluish gray limestone dips about 10° northwesterly. In the upper quarry, 160 ft. above the works, the limestone has a very light color. The beds are from 5' to 7' thick. The rock is broken down by hand-drilling, the holes having the depth of the beds, with about 5' face, blasting being done with black powder. The marble was principally used for ornamental building purposes, but some monument work is turned out. It has been used in the Academy of Sciences, Crossley, and Monadnock buildings of San Francisco, in the latter, being trimmed with verde antique marble from Sec. 28, T. 7 N., R. 2 W., S. B. M., and also in the Lankershim Hotel, Los Angeles. It was mostly cut in 1" stock. The plant was equipped with 6 gang saws; one 14-foot ribbing bed; 2 polishing machines; 1 countersinking machine; 1 tile machine, and 1 machine for cutting plumbers' slabs, etc. Power was furnished by a 100 h.p. boiler using oil as fuel; one 50 h.p. steam engine, and one 50 h.p. electric motor.

Scheerer Marble Deposits (*see* also under Limestone). Some white marble was produced from this quarry during the past year (1915). It is fairly accessible, being only $3\frac{1}{2}$ miles by a good wagon road from Scheerer Siding on the Santa Fe Railroad. Joseph Scheerer of Victorville is the owner.

St. Francis Marble Mine is in Sec. 28, T. 10 N., R. 1 W., S. B. M., about $2\frac{1}{2}$ miles northeast of Barstow. White, variegated and gray colored marble is said to occur in slabs 1' to 4' thick, in a deposit of considerable extent. Very little development work has been done as it is worked for assessment only. Owners, Chas. McIlroy and F. C. Mitchell, Barstow, Cal.

Three Colored Marble Quarry is in the unsurveyed portion of T. 7 N., R. 2 W., S. B. M., 22 miles south of Barstow and 10 miles southeast of Hicks Station on the Santa Fe Railroad. The marble is found on the east flank of a bare, rugged ridge, locally known as Stoddard Peak Ridge, and is reached by a good desert road from Barstow. The only water in the district is at Stoddard Well, 6 or 8 miles from the deposit on the road to Barstow. The deposit consists of a number of beds of brecciated mottled green, black, and white marble varying in thickness from a few inches to over 10 ft. Where best developed the marble occurs through a thickness of 200 ft. or more. The strike of the beds is north and south, the dip westward at a low angle into the ridge.

Quoting from the report of R. W. Pack⁵⁷: "The marble is essentially a brecciated, white, crystalline limestone recemented by a greenish

⁵⁷U. S. G. S. Bulletin 540, pp. 365-367.

calcareous cement. The brecciated fragments are angular and vary in size, some of them being as much as 6 or 8 inches in length. In general effect the marble is mottled green, black, and white, but this appearance varies greatly, owing to the irregular size and staining of the brecciated fragments, to their irregular spacing, and to the differences

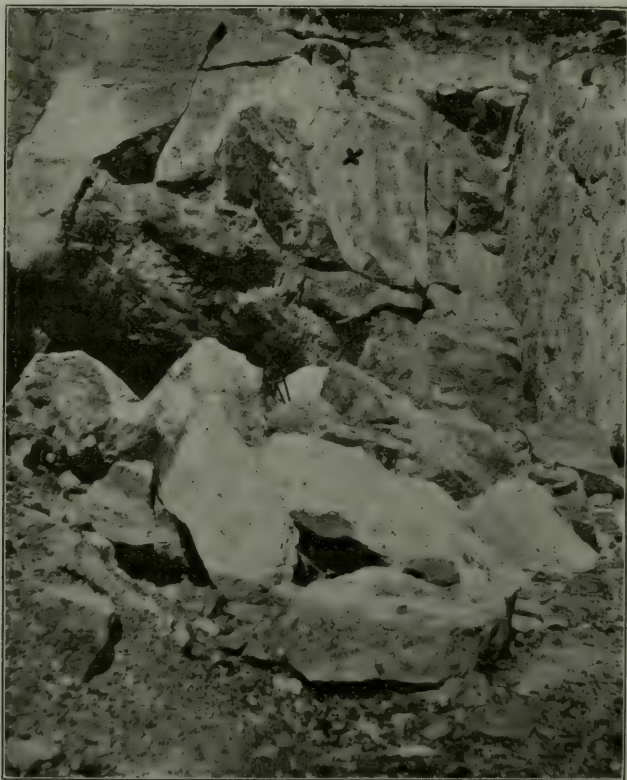


Photo No. 48. Three Colored Marble Quarry—showing large broken blocks at face of quarry. The block marked X measures roughly 6'x7'x9'.

in the tone of the cementing materials. The marble shows very little decomposition from weathering, but it is extensively jointed and the surface outcrops show very few unbroken blocks more than 3 ft. in diameter. Many of the joints unquestionably disappear with depth. This is well shown in a small cut driven about 20 ft. into the hill near the center of the deposit (*see* photo No. 48), where several large blocks apparently free from flaws, were obtained."

The deposit is practically undeveloped, only a few hundred feet of stone having been removed, some of which was used in the Stevens building at Santa Barbara. The quarry at present is 25' wide, 20' into the hill, with a 30' face. This deposit is of great commercial value as the marble is a highly ornamental stone. No work is now being done on it. The owner will lease or sell this property. E. T. Hillis, owner, Barstow, Cal.

Verde Antique Marble Quarry, formerly known as the Gem Quarry or the Kimble Mine, is in Sec. 28, T. 7 N., R. 2 W., about 2 miles southwest of the Three Colored Marble Quarry. It was worked years ago, and some of the marble, a mottled serpentinous limestone of yellowish green color, was used for interior decoration in several buildings in Los Angeles and San Francisco. The quarry has been idle for a number of years.

Bibl.: Bulletin 38, pp. 147-148.

Numerous **other deposits** of marble occur in the county, none of which have been developed to any extent, and all of which are idle. For detailed descriptions of these deposits see our Bulletin No. 38, pp. 102-106.

MINERAL PAINT.

Mulcahy Deposit. A deposit of mineral paint occurs in the Calico district, 5 miles by auto road west of Yermo on the Salt Lake Route. This deposit is a vein of hematite ochre, which was cut by a tunnel driven to cut a silver ledge below the old Silver King group. The vein outcrops on the surface about 35' above the tunnel and varies in width from 6" at the outcrop to at least 2' in the bottom of the tunnel. Another vein of the same material is exposed a couple of hundred feet distant in an open cut. The material is of a uniform deep red color, greasy to the touch, free of grit, and crumbles readily in the hand, leaving a metallic red stain. It appears to be an excellent mineral paint, but as yet the deposit is undeveloped. The owners are now trying to find a market for the material. Owners, J. C., M. and John Mulcahy, Daggett, Cal.

MINERAL WATER.

In the following descriptions of the mineral springs of San Bernardino County free use has been made of data from U. S. G. S. Water Supply Paper 338, by Gerald A. Waring, who made a thorough investigation of the springs of California.

Arrowhead Hot Springs are located some 7 miles east of north from San Bernardino and at about 500 ft. in elevation above the floor of the valley. The name is derived from the location on the mountain side just above them, of an area of scanty vegetation in the shape of an arrowhead several acres in extent. (See Photo No. 49.) This striking

landmark is associated in Indian legends with the hot springs. It is stated that within the memory of the white inhabitants of the district, the mountainside has been burned over two or three times by brush fires; and yet the new growth of vegetation still retains the characteristic outline of the arrowhead.

The fine three-story hotel with bathing facilities at the springs was erected in 1907 on the site of the earlier building which was burned.

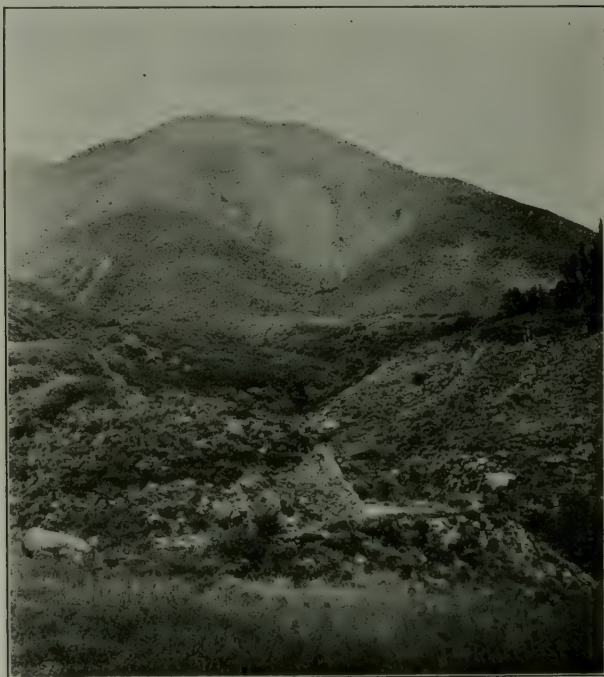


Photo No. 49. The Arrowhead at Arrowhead Hot Springs, San Bernardino County, Cal. Photo by Walter W. Bradley.

It is reached by an electric earline from San Bernardino. The springs form two groups situated about 400 yards apart. The upper group comprises perhaps half a dozen springs whose observed temperatures range from 110° to 145° F. The water is confined in two concrete storage basins that are in part the foundations of the original bath-house, and it is thence piped to the baths and the heating pipes throughout the hotel, which is about 200 yards southwest of the basins. The Palm Spring, on the mesa north of the hotel, is in this group. The second group lies in a ravine to the west and also comprises about half a dozen springs. Water from one of these is pumped to the storage

basins at the upper group to augment the supply for the hotel. The hottest water is in the spring known as El Penyugal, in the lower group. This spring is surrounded by a concrete basin and the water is used for drinking. A temperature of 187° was recorded in the basin and in sampling for one of the analyses the basin was drained and a temperature of 202° registered. The spring discharges perhaps 15 gallons a



Photo No. 50. The Steam Caves at Arrowhead Hot Springs. Photo by Walter W. Bradley.

minute. Granite Spring is on the mesa on the west side of Penyugal Cañon. The total yield of the Arrowhead Hot Springs is hard to estimate, but it is probably not far from 50 gallons a minute. Water from a cool spring, Fuente Frio, situated about a quarter of a mile north of the hotel, was placed on the local market as a table water during 1909. Agua Fria is the water of Cold Cañon at the head of the pipe line leading to the main reservoir on the high mesa north of the hotel. Analyses of several of the springs are given below. The hot springs are stated to carry small amounts of arsenic, as well as possessing some radio-activity.

Confirmation of radio-activity has been made recently by Prof. Gilbert E. Bailey⁵⁸ of the University of Southern California, who conducted a series of experiments at Arrowhead during the past summer. The instrument used was similar to that employed by Schlundt & Moore⁵⁹ in testing the waters of Yellowstone Park, Wyoming. "The Arrowhead hot springs issue from fissures that are a part of the great Cajon

⁵⁸Letter to State Mining Bureau, Oct. 12, 1916.

⁵⁹U. S. G. S. Bulletin 395.

Analyses of water from Arrowhead Hot Springs and Waterman Hot Springs, San Bernardino County, California.⁶⁰
(Constituents are in parts per million.)

Temperature	1		2		3		4		5		6		7		8		9	
	Hot 89° C. (193° F.)		Hot 89° C. (193° F.)		94° C. (202° F.)		Hot		70° C. (158° F.)		82° C. (180° F.)		Cool		Cool		70° to 83° C. (158° to 200° F.)	
Properties of reactions:	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values
	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	ing values	ing values	ing values
Primary salinity	86	83	89	86	82	82	82	82	82	82	82	82	50	42	42	42	82	82
Secondary salinity	0	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tertiary salinity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primary alkalinity	11	4	9	13	12	12	12	12	12	12	12	12	18	18	18	18	8	8
Secondary alkalinity	14	4	9	13	12	12	12	12	12	12	12	12	32	32	32	32	10	10
Tertiary alkalinity	47	21	30	42	26	26	26	26	26	26	26	26	18	18	18	18	23	23
Constituents	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values	By weight	Reac- ing values
	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	Reac- ing values	ing values	ing values	ing values	ing values
Sodium (Na)	313	13.6	291	12.6	289	12.6	315	13.7	254	11.0	222	9.65	152	6.65	15	6.65	249	10.8
Potassium (K)	Trace	Trace	Trace	Trace	Trace	Trace	10	.26	18	.46	11	.28	.01	.03	12	.03	Trace	Trace
Lithium (Li)																		
Barium (Ba) and strontium (Sr)																		
Calcium (Ca)	44	2.20	16	.80	29	1.45	43	2.15	20	1.45	21	1.05	.17	.26	24	.25	24	1.20
Magnesium (Mg)	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Iron (Fe)	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Sulphate (SO ₄)	512	11.3	582	11.4	532	11.1	78	2.20	65	1.83	360	7.50	31	4.2	402	.09	402	8.37
Chloride (Cl)	81	2.38	65	2.40	58	2.54	64	2.13	77	2.37	71	2.37	14	.39	63	.47	63	1.78
Carbonate (CO ₃)	66	2.20	18	.60	58	1.35	64	2.13	77	2.37	71	2.37	14	.39	63	.47	63	2.23
Metaborate (BO ₂)																		
Silica (SiO ₂)	224	7.43	85	2.82	99	3.28	205	6.80	91	3.02	73	2.42	53	1.00	81	1.00	81	2.69
Hydrogen sulphide (H ₂ S)	1,270	1,076.1			1,136.4		1,280		950.4		813.7		138.4		86.0		898.6	
			4.3	.25	8.5	.50			2.2	.13	2.3	.13					2.4	.14

1. El Penyal. Analyst, Oscar Loew, 1876; Wheeler report, p. 103.

2. El Penyal. Analyst, E. W. Hiltard, 1900; p. 116-117.

3. El Penyal. Analyst, G. E. Bailey, 1910; advertising matter.

4. Spring near hotel. Analyst, Oscar Loew, 1876; Wheeler report, p. 103.

5. Granite. Analyst, G. E. Bailey, 1910; advertising matter.

6. Palm. Analyst, G. E. Bailey, 1910; advertising matter.

7. Fuente Fria. Analyst, G. E. Bailey, 1910; advertising matter.

8. Agua Fria. Analyst, G. E. Bailey, 1910; advertising matter.

9. Waterman. Analyst, G. E. Bailey, 1910; advertising matter.

(An earlier analysis of this water by Dr. Frederick Salathe is very similar.)

⁶⁰Waring, loc. cit., p. 34.

fault running from the San Gorgonio Pass, across the Cajon region to Tejon Pass, where it joins the San Andreas fault. The geologic and chemical evidence is that the waters of these hot springs are not from local rainfall and seepage, but are magmatic. The waters of Penyugal Spring, Mud Springs and the Steam Caves were tested, all showing radio-activity."

About half a mile from the hotel, on the east side of Waterman Cañon, are the "Steam Caves." They have been artificially formed and consist of tunnels cut into the bluff, from the sides, roofs and floors of which the mineral-bearing vapors issue. Small cottages equipped as dressing rooms are connected with the caves by a covered way. (See Photo No. 50.

Bitter Spring is about 12 miles east of Garlic Spring and near the southeast side of a small intermittent lake. It formed a watering place on the emigrant road between Salt Lake City and San Bernardino as early as 1852 and has been a camping place since that time, but the water contains large amounts of sodium and sulphates.

Deadmans Holes. These are small pools known as Deadmans Holes, in the playa surface at the northwest side of Mesquite Dry Lake near the road between Victorville and Dale Mining Camp. These pools or springs are sometimes used as watering places, but their water contains large amounts of alkaline material, probably sodium, magnesium and sulphates.

Garlic Spring is on the road between Daggett and Death Valley, about 35 miles northeast of the former place. It yields a small supply and has been used as a camping place, but its water contains a large amount of sodium, magnesium and sulphates.

Harlem Hot Spring. Hot water formerly issued at Harlem Hot Spring on the alluvial slope 2 miles below the base of the San Bernardino Mountains. A well casing has been sunk in the former spring and the water is pumped for bathing, and in summer for irrigation also. During periods following seasons of abundant rainfall the well overflows, but the water level usually stands a few feet below the surface. The property is beside an electric car line and is only a few minutes ride eastward from San Bernardino. It has been made a recreation and picnic ground and the water supplies a swimming plunge and tub and mud baths. A partial analysis of the water, which has a local market as a table water, is tabulated beyond, with that of water from Urbita Hot Springs. Primary salinity is dominant in both waters.

Paradise Springs. In the desert of western San Bernardino County is an isolated group of thermal springs that may properly be described here. They are 25 miles by road north of Daggett and on the eastern slope of a granitic mountain. Two warm springs and a few seepages issue in a belt 250 yards long, on the side of a wide drainage

slope that opens southeastward to the desert. The highest temperature observed was 102° and the total flow is perhaps 25 gallons a minute.

In the early emigrant days these springs were a favorite camping place for travelers, and the area of green in this stretch of desert earned them the name of Paradise Springs. The locality is still used as a camping place by prospectors, and in 1908 a 1½-inch pipe line extended from the springs southward and westward 2 miles to the Paradise Mountain gold mine. The water issues on slopes 500 feet above the desert floor, but evaporation in the region is so great that a considerable alkaline deposit has formed at the springs. The water rapidly corroded the pipe leading to the mine.

A prospect drift exposes iron-stained graphic granite about 40 yards above the warmest spring, and there is a ledge of crumpled, quartzitic rock near by. It seems probable that these dikes or ledges may act as dams that here bring water to the surface from moderate depths, at a locality where intrusive rocks have produced an abnormal temperature gradient.

Salt Spring at the southeast end of South Death Valley and about 5 miles southwest of Dumont railroad station, is probably better known than the saline springs farther north in the valley. It was mentioned many years ago by Fremont, who camped there in April, 1844, and described the springs as being "a very poor camping ground; a swampy, salty spot, with a little long, unwholesome grass; and the water which rose in the springs being useful only to wet the mouth but entirely too salt to drink."¹ The springs are in the cañon of South Branch of Amargosa River. This cañon forms a pass between the Kingston Range and the Avawatz Mountains, but desert travel has been mainly north of it, through the cañon of the main branch of the river. It has been said that the water contains arsenic, as several people have perished from drinking it, but the fatalities have probably been due rather to the effect of such a strong solution of Epsom and Glauber salts on persons who were nearly delirious with thirst.

Sulphur Springs, near Bullion Mountains. Several springs of strongly sulphuretted water issue near the southern end of Bullion Mountains, in flat land on the road that leads southeastward from Victorville to Dale mining camp. The yield of water is considerable, but it tastes too strongly of hydrogen sulphide to be palatable. It is seldom used for watering, as there is better water about 2 miles farther north.

Urbita Hot Springs: about 1 mile south of San Bernardino a recreation park known as Urbita Hot Springs has been built about a group of artesian wells that yield thermal water. This water supplies a swimming plunge, tub baths, and a small lake. The warmest well yields

¹Fremont, J. C., Report of the exploring expedition to the Rocky Mountains, p. 264, 1845.

about 200 gallons a minute of mildly sulphuretted water that is said to have a temperature of 106°. The following partial analysis shows that, like the water at Arrowhead and at Harlem springs, it is not highly mineralized, but small amounts of sulphur and iron constituents in the water cause it to stain the enameled bathtubs:

Analyses of water from Urbita Hot Springs and Harlem Hot Spring, San Bernardino County, California.

(Analyst, E. W. Hilgard. Authority, advertising matter. Constituents are in parts per million by weight.)

	Urbita	Harlem
Properties of reaction:		
Primary salinity	Dominant	Dominant
Secondary salinity	0	(?)
Tertiary salinity	0	0
Primary alkalinity	Small	(?)
Secondary alkalinity	Small	Small
Tertiary alkalinity	Present	Present
Residue:		
Combined water	80	60
Soluble in water	310	260
Insoluble in water	25	90
	415	410
Portions soluble in water:		
Sulphate (SO ₄)	133	144
Chloride (Cl)	21	10
Carbonate (CO ₃)	42	16
Chiefly sodium (Na) and potassium (K)	114	90
Portions insoluble in water:		
Silica (SiO ₂)	10	50
Calcium (Ca), magnesium (Mg), carbonate (CO ₃) and sulphate (SO ₄), chiefly calcium	15	40

As has been previously stated, the area along the western base of San Bernardino Mountains is a faulted zone. The issuance of hot water within this area therefore seems to be due to a fault or structural break in the granitic rocks, which allows deep-seated thermal water to reach the surface. The abnormal temperature of Harlem Hot Springs is possibly due to leakage into the alluvium of heated water that rises in the faulted zone. This may also be the source of the warm water at the Urbita wells, though there is a bedrock area 1 mile south of these thermal wells that may cause underground alluvial water to rise from a depth sufficient to account for its high temperature. Warm water is also obtained from other flowing wells in this locality. The sulphurous elements of the water from the Urbita wells are probably derived from material in the alluvium rather than from constituents in deep-seated hot water that may enter the alluvium.

Valley Spring. A few strongly saline springs issue in the southern extension of Death Valley proper, in the portion that is known as South Death Valley. Valley Spring, which rises in a marshy area on the western side of South Death Valley, is probably the largest of these.

The water forms a clear stream that flows for a short distance, but it is strongly saline. The source of the water is believed to be Amargosa River, which normally sinks a few miles to the southeast. A portion of its flow is apparently brought to the surface at the spring by a ledge of rock that is there exposed above the valley floor.

Warm Spring, at Baldwin Lake. Baldwin Lake is a small intermittent water body at the upper end of Bear Valley, in San Bernardino Mountains. In a marsh at the western end of the lake warm water rises in a pool about 20 feet in diameter and has been used to some extent for bathing, but as the flow is slight and the temperature of the water is only 88°, it has not become important.

Warm Springs, in Lytle Cañon. About 13 miles in a direct line north of west from the Waterman Springs in Lytle Cañon a hot spring forms a pool in the creek bed. The water was at one time used for bathing and the place was known as Tyler's Bath. It is not improved, however; the flow is small and the water is only 90° in temperature.

NITER.

Nearly all the niter beds, so far as discovered, are situated in the northern part of San Bernardino County, and extend across the boundary line into the southern part of Inyo County. They are found along the shore lines, or old beaches, that mark the boundary of Death Valley as it was during the Eocene times. (Bulletin 24, pp. 155-156.)

The general appearance and geology of the beds have been described in our Inyo County report (1916) so will not be repeated here. No niter has been produced from these beds, but considerable sampling has been done, mainly by the two companies mentioned below, who are now actively engaged in trying to promote their full exploration and development. With the construction of the proposed spur railroad to the Avawatz salt deposits (see under Salt) the beds of the California Nitrate Development Company will be easily accessible, a factor that should greatly aid in their early development.

California Nitrate Development Company, 40 California St., San Francisco, A. W. Scott, Jr., president; Sam Hubbard, secretary. This company owns the Owl, Round Mountain, Saratoga, and Valley beds, in San Bernardino County, and the Confidence beds in Inyo County, totaling 8800 acres. The Saratoga beds consisting of 1920 acres are the only claims patented. These beds form the main portion of a partially eroded beach that lies at the junction of the Avawatz Range and Death Valley. The road from Johannesburg to Saratoga Springs passes through the eastern portion of the beds. Water is available at Saratoga Springs in sufficient quantities for all working purposes.

The Owl beds lie 20 miles southwest of Saratoga Springs on the Johannesburg road on the east flank of the Owl Mountains. Water is also available here in smaller amounts.

The Round Mountain beds are the western extension of the Saratoga beds. The Valley beds lie 12 miles northwest of Saratoga Springs on the north rim of Death Valley.

Bibl.: Bulletin 24, pp. 176-178.

Pacific Nitrate Company, 527 Consolidated Realty Bldg., Los Angeles; Walter R. Fales, president; C. B. Ellis, secretary. This company owns the Upper Cañon and Lower Cañon niter beds, a total of 2200 acres along the Amargosa River. Those claims are patented. The beds are very accessible, as the Tonopah and Tidewater Railroad traverses the claims. Water for working purposes can be obtained from the Amargosa River.

The Upper Cañon beds extend along both sides of the Amargosa River, and over the line into Inyo County. (See Inyo County report.)

The Lower Cañon beds are located on the east side of the Amargosa River, 4 miles south of the Upper Cañon beds. Considerable prospecting has been done on these claims, over 14 miles of trenches having been dug. It is said that present development shows from 5% to 10% niter in the "caliche," which varies from 6" to 18" in thickness.

Bibl.: Bulletin 24, pp. 174-175.

Several **other occurrences** of the niter beds in San Bernardino County are reported, none of which have been developed.

PETROLEUM.

Exploration for petroleum has been carried on in that portion of the Mojave Desert between Mojave and Barstow by several different companies spasmodically since 1900. Indications of oil were reported by two companies, but no quantity was found. The greatest depth attained was 3000 ft. In 1912 R. W. Pack⁶² of the United States Geological Survey made a reconnaissance of the eastern part of the region, and is entirely adverse to the idea that oil occurs in this region. He writes: "Traces of oil and gas are present in different parts of the world in fine-grained sedimentary beds, and it is possible that similar traces of oil may exist in the fine-grained detrital beds of this region, but it is highly improbable that oil and gas occur here in greater amounts. The principal reasons for believing that this land will not prove productive are: (1) The lack of strata from which it would seem reasonable to believe that oil might have been formed, especially the lack of thick masses of organic material (diatomaceous and foraminiferal shale) such as those which occur in or near all the oil fields in the southern half of California and in which oil is believed to have origi-

⁶²U. S. G. S. Bulletin 541, pp. 141-154.

nated; (2) the lack of structural features favorable for the collection of petroleum even if it existed disseminated through the strata."

The following is a brief description of the work done in this district.

The Kramer Consolidated Oil Company's well is in the NW. $\frac{1}{4}$ of Sec. 11, T. 10 N., R. 5 W., 3 miles north of Hawes, a station on the Santa Fe Railroad. The well was drilled to a depth of 3000 ft. and it is said some light gravity oil was obtained.

The Chicago-Barstow Oil Company's well is on the SW. $\frac{1}{4}$ of Sec. 35, T. 11 N., R. 1 W., S. B. M., 8 miles north of Barstow. This well attained a depth of 2720 ft. and is said to have shown traces of oil at several levels. The rig caught fire and was completely destroyed.

The Barstow Paraffine Oil Company's well is in the SE. $\frac{1}{4}$ of Sec. 17, T. 32 S., R. 44 E., about a mile west of Black Cañon, and was known as the Giroux well. It attained a depth between 300' and 400' and was abandoned.

The Mojave Oil Company's well is in the SE. $\frac{1}{4}$ of Sec. 14, T. 11 N., R. 12 W., $2\frac{1}{2}$ miles southeast of Mojave. A depth of about 1200' was attained and some indications of oil reported.

Bibl.: U. S. G. S. Bulletin 541, pp. 151-152.

SALINES.

(Other than Borax.)

Salt.

There are inexhaustible deposits of salt widely distributed over the desert portion of San Bernardino County, many of which have not been developed. Several companies are now producing limited amounts and there is an excellent outlook for an increased production in the near future. The following is a brief description of the companies now engaged in developing salt deposits:

Avawatz Salt and Gypsum Company, 1112 Garland Bldg., Los Angeles, Cal.; H. H. Kerekhoff, president; Thos. L. Henderson, secretary. This company has 52 claims, containing about 5200 acres, along the northeast margin of the Avawatz Mountains, 10 miles west of the Tonopah and Tidewater Railway. A large bed of rock salt, which is said to be over 95% pure, sodium-chloride and 10' to 12' thick, outcrops for a distance of several thousand feet. This rock salt occurs in an old lake bed, overlaying a basement complex of stratified rocks, and being partially concealed by later gravels. In the lake bed occur also beds of gypsum and celestite. In general the strike of the beds follows the north edge of the Avawatz Mountains, curving to the northwestward. As a rule the salt is massive and shows no crystalline structure and is reddish or brown in color, due to small amounts of iron oxide or colored clay. Considerable development work has been done at this property, over 5000' feet of shafts, drifts and cuts having been driven.

The company is now preparing to construct a spur track from the Tonopah and Tidewater Railroad to their deposit and expect to start producing shortly.

Bibl.: Bulletin 24, pp. 126-128; U. S. G. S. Bulletin 540, pp. 526-530.

Consumers Salt Company, 304 Grant Bldg., Los Angeles; L. E. Stump, president; J. G. Hunter, secretary. This company is working a deposit of rock salt in an old lake bed 4 miles south of Saltus Siding



Photo No. 51. Mill of the Consumers Salt Company at Saltus, 3 miles east of Amboy.

on the Santa Fe Railroad. The 4' overburden of sand and gravel is removed, and the salt blasted out with dynamite. A narrow-gauge railroad connects the mine with the mill, located at Saltus, 3 miles east of Amboy. The salt is hauled to the mill in 6-ton cars by a steam engine, where it is crushed, washed in a saturated brine, and then dried in a rotary calciner. Mill is operated by a 25 h.p. gas engine. The water is pumped from a well at the mill. The salt is mainly marketed for use in freezing ice-cream. Producing about 300 tons monthly, but expect to increase this production shortly. Four men are employed.

R. B. Evans, Pasadena, Cal., is working a deposit of rock salt at Danby Dry Lake, south of Ward Siding. The salt is quarried and hauled by wagon to Ward, from where it is shipped to consumers in southern California. Only a small production has recently been made from this deposit, as a modern plant is necessary for refining the salt. Six men are employed.

The Milligan Salt Company is producing a high grade table salt at Milligan, a siding on the Parker branch of the Santa Fe Railway, 23 miles west of Blythe Junction, the nearest post office. The salt is produced by evaporating a saturated brine in vats and recrystallizing the

salt. Very little salt has been as yet produced, as the work has been largely experimental. Fred D. Smith of Milligan is manager.

Descriptions of the numerous **undeveloped salt** deposits of San Bernardino County appear in our Bulletin 24, "The Saline Deposits of California," pp. 126-133, so will not be repeated here.

Soda and Potash.

Searles Lake, for many years an important source of borax, is now being exploited as a source for potash and soda by the **American Trona Company**. A description of its physical peculiarities and probable origin is given under **Borax**, to which the reader is referred.

The announcement of Searles Lake as a possible source of potash salts was made as the result of the collection and analysis of a set of brine samples from it in March, 1912, by E. E. Free and Hoyt S. Gale⁶³.

The following description is extracted from Mr. Gale's report: "The physical status of the main saline deposit in the bed of Searles Lake today is revealed by a large number of borings that have been put down by private interests in various explorations of the salt beds and by the analyses that have been made from them. So far as has been determined the main salt body appears to be a bed at least 11 or 12 miles in extent and having a depth of from 60' to 70'. This body of salt is chiefly crystalline, in part compact, but in general is believed to be of cellular or open crystalline structure, being really a body of salts standing in the residual brine from which it is crystallized. Experiments in the wells that have been put down appear to show that this brine is in nearly all parts of the salt bed free to flow and that it stands high in the deposit, approximately at the actual surface of the salts."

The following is a complete average analysis of the brine made from samples collected March 6, 1912, by the United States Geological Survey:

SiO ₂	0.02%
As .....	.06%
Na	33.19%
K	6.22%
CO ₂	7.11%
SO ₄	12.76%
Cl	36.80%
B ₂ O ₃	2.45%
Total	98.21%

Total salts (ignited residue percentage of original sample), 33.30; specific gravity, 1.2974.

American Trona Corporation, 366 Pacific Electric Bldg., Los Angeles, Alfred von der Ropp, president; J. H. Brown, secretary. This company was incorporated in 1913 to operate a plant primarily for the extraction of borax and potash and eventually other salts from

⁶³U. S. G. S. Min. Resources 1912, Pt. 11, p. 886. See also Bull. 540, p. 405; and Prof. Pap. 98A.

the Searles Lake brine. An elaborate and costly experimental plant was erected to test different types of apparatus, and the 31-mile railroad built from Searles, on the Nevada and California Railroad, to



Photo No. 52. Drilling at Searles Lake.

the town of Trona, where the new million-dollar plant is being erected (see photo No. 54). It is expected that 500,000 gallons of brine will be handled daily at the new plant, which will be completed during this



Photo No. 53. Camp of the American Trona Company previous to the construction of the new plant, at Trona, Searles Lake, Cal.

year (1916). A first concentration of the salts will be made here and the product shipped for further treatment in the refinery of the company at San Pedro, Los Angeles County.



Photo No. 54. New million-dollar plant of the American Trona Corporation at Trona on northwest edge of Searles Lake, for the extraction of borax and potash from the brine of Searles Lake. Photo by C. A. Waring, March, 1916.

SANDSTONE.⁶⁴

There is a deposit of sandstone suitable for building purposes in the east end of the San Bernardino Valley, on Mill Creek, in Sec. 7, T. 1 S., R. 1 W., S. B. M. In former years two companies were formed to quarry this material, but both of them are now out of existence.

The Mentone Sandstone Company operated in the southwest quarter of the section. The stone was used in the Hall of Records in San Bernardino; it is a tawny-colored, medium-grained sandstone. It is claimed that the best material was found near the surface, and that in depth the proportion of shale increased. The company suspended operations a number of years ago.

The Southern California Sandstone Company operated in the same section.⁶⁵

STONE INDUSTRY.

Granite.

Granite occurs over considerable areas in San Bernardino County, but is quarried only at Delez, Oro Grande and Victorville.

The Delez deposits are in Sec. 35, T. 1 S., R. 6 W., S. B. M., 9 miles west of Colton, and are commercially the most important. The stone has been used for several years in building the government breakwater at San Pedro, for building stone used in Los Angeles buildings, and for curbstones used in several of the southern cities. This material is described on our Bulletin 38, p. 48, as follows. "The stone is rather dark-colored biotite granite, which has a gneissoid structure in places.

⁶⁴Bulletin 38, p. 132.

⁶⁵See also Report IX, p. 225.

There are a number of feldspar veins from 2" to 4" wide, which consist principally of orthoclase feldspar, but in a few places contain large biotite crystals. The rock is partially disintegrated for a few feet from the top, but below this comparatively thin weathered portion it is bright and fresh, and below the few feet of weathered stone the rock could be quarried in blocks large enough for dimensional stone, and good building and monument stone could be obtained."

The Russell-Greene-Foel Company, 816 Higgins Bldg., Los Angeles, are quarrying this stone for use as ballast, rubble and riprap.

The Oro Grande Quarries⁶⁶ have furnished considerable granite in past years, but they are not in operation at present. About two miles south of Oro Grande the Mojave River cuts a narrow cañon through the granite, which forms rocky hillsides on each side of the river. On the west side of the river the granite is deeply disintegrated, and except on the river bluff no solid granite appears at the surface. On the east side of the river the granite is in rounded ledges, and rounded boulders of disintegration cover an area of more than a square mile. In several different places over this area small granite quarries have been operated, the product being mostly Belgian (paving) blocks. The quarries are in Secs. 28 and 29, T. 6 N., R. 4 W. Most of the work has been done on the surface boulders, but in a few places some work has been done on the solid ledge underneath the boulders. The quarrying has been done almost entirely by hand, and most of the product has been paving blocks, although some building and monument stone has been shipped.

Joseph Scheerer of Victorville has a deposit of granite in Secs. 26 and 27, T. 6 N., R. 4 W., which has been given the trade name of "Scheerer's Firestone." Though somewhat pulverulent under blows it has shown unusual fire-resistant qualities for a granitic rock. Scheerer has used it for several years in lime-kiln construction, and more recently it has been utilized with success as a rotary cement kiln lining by the Riverside Portland Cement Company. The following extract of a letter from a member of their staff, dated October 2, 1915, is of interest:

"I am pleased to inform you that the firestone blocks taken from your property near Victorville and placed in a rotary kiln of the Riverside Portland Cement Company, have proved to be of exceptional quality. This stone was superior to any brick used. Unfortunately we were compelled to close this kiln down after a three months' run, so did not find out the real life of these blocks, but on inspection of lining, found the fire brick on each side of this stone reduced to about 4 inches, while the firestone ran from 6 to 7 inches in thickness. The firestone was also placed at point in kiln where it was exposed to a higher temperature than the bricks. I am not in a position to give you data on

⁶⁶Bull. 33, pp. 48-50.

second consignment of these blocks. Personally, I believe you have an exceptionally good material owing to its heat resisting qualities."

Microscopic examination of a thin section of the rock shows it to be a highly acid granite, consisting mainly of quartz and orthoclase with a minimum of mica, and a small amount of albite. The feldspars show a slight kaolinization, and it may be that a slight fusion of this kaolin results in cementing the rock particles and so assists in resisting the slight abrasion as well as the high temperature of the cement kiln. The spur track of the Southwestern Cement Company will pass through both this and the dolomite deposit owned by Scheerer. The "firestone" has been located by separate claims, covering an area of 70 acres.

Mr. Scheerer has also a quarry in Sec. 29, from which considerable granite has been quarried by the Santa Fe Railroad for use as rubble and riprap along its roadbed between Victorville and Oro Grande. The stone is hauled from Scheerer's Siding.

Near **Victorville** several quarries were formerly operated producing principally paving blocks. Only one quarry is at present being worked.

The **Victor Quarry** is in Sec. 3, T. 5 N., R. 4 W., S. B. M., 2 miles north of Victorville. It is also known as the Stockholm Stone Quarry. Granite boulders of a yellowish cast are cut by hand into paving blocks, varying from 8" to 12" long, 4" to 6" wide, and 6" thick. Some curb-stones have been cut from these boulders. This quarry has been worked spasmodically since its location in 1904. Mr. James Hargraves, Victorville, Cal., is the owner.

Bibl.: Bull. 38, p. 51.

Crushed Rock, Sand and Gravel.

The **California Portland Cement Company** produces crushed rock for macadam and for concrete from their quarries near Colton.

The **Colton Sand Company**, C. M. Lestrangle, manager, Colton, is developing a large deposit of sand near Colton which is said to be very clean and well adapted for use in making cement. Three men are employed at the property.

STRONTIUM.

Beds of celestite (strontium sulphate) are stated to occur associated with the colemanite layers at the old borax mines of the Pacific Coast Borax Company at Calico. No attempt has as yet been made to utilize this strontium mineral, commercially. See also Avawatz Salt and Gypsum Company, under Salt.

L. A. Davis, Stagg, post office (Ludlow)—see under Barytes.

T. G. Nicklin, Barstow, reports he has a deposit of high grade strontianite (strontium carbonate), covered by four claims. It is 10 miles north of Barstow by a good wagon road. A deposit of wither-

ite (barium carbonate) is stated to be associated with the strontianite. Developing.

J. H. Sloan, Barstow (*see* under Feldspar).

TALC.

This mineral occurs in the vicinity of Riggs, a station on the Tonopah and Tidewater Railroad, and has been mined on a small scale for several years by the **Silver Lake Talc Company** of Los Angeles. The talc is remarkable for its whiteness, its mode of occurrence, and its origin. Quoting from the report of J. S. Diller⁶⁷: "The talc deposit near Riggs, 10 miles north of Silver Lake, has been traced northwest and southeast nearly a mile and opened at several points. As elsewhere in the region it lies between limestone and diorite, although there is much red granitic and aplitic intrusive as well as mica schist and other metamorphic rocks near by. This talc body has a thickness of 5 feet and is well banded, as if stratified parallel to the overlying limestone. The best talc is near the bottom. In thin sections under the microscope it appears to be made up of fibrous and nonfibrous material, apparently talc and tremolite."

Other deposits of talc occur on Sheep Creek, 20 miles northwest of Silver Lake, and in the hills 7 miles east of Riggs. These occurrences are essentially the same as that at Riggs, but very little development work has been done on them.

Ibex Talc Mine, south of Zabriskie, and owned by the Fifty Associates Securities Company, Union Oil Bldg., Los Angeles. The talc occurring here is a high grade, white material similar to that described above.

⁶⁷U. S. G. S. Mineral Resources 1913, Pt. II, pp. 159-160.

TULARE COUNTY.

By W. BURLING TUCKER, Field Assistant.

Field work in June, 1916.

DESCRIPTION.

Tulare County, one of the largest counties of the San Joaquin Valley, is bounded on the northwest and north by Fresno, on the east by Inyo, on the south by Kern, on the west by Kings County. It has an area of 4856 square miles. The eastern half of the county lies in the Sierra Nevada. The western half extends across the San Joaquin Valley, and is fairly level, except a small portion in the extreme west which extends into the Coast Range. The eastern boundary of the county commencing at the crest of the Sierras embraces Mount Whitney, which is the highest peak in the United States, with an altitude of 14,501'. Besides Mount Whitney on the northeast boundary line between Tulare and Inyo counties are: Mount Tyndall, 14,300', Mount Williamson, 14,364', Mount Bernard, 14,030', Mount Russell, 14,190', Mount Langley, 14,042' and Mount Le Conte, 13,960'.

Situated in the north central part of the county are the Sequoia and General Grant national parks which contain the greatest groves of the oldest, the biggest and the most remarkable trees (*Sequoia Washingtoniana* or *gigantea*) living in the world. They number 1,156,000, of which 12,000 exceed 10 feet in diameter. The General Sherman tree, most celebrated of all, is 279.9' high with a diameter of 36.5'.

The General Grant National Park is usually mentioned with the Sequoia because, though separated by six miles of mountains and forest, the two are practically the same national park. It contains 2536 acres and was created only for the protection of the General Grant tree, a monster sequoia, 264 feet high and 35 feet in diameter. The sequoias are found scattered all over the park, which has an area of 161,597 acres. The country is one of the most beautiful in America, abounding in splendid streams, noble valleys, striking ridges and towering mountains.

Watershed and rivers.

As the eastern boundary of the county commences at the crest of the Sierras and extends north and south about 75 miles, embracing a series of the highest peaks of the Sierra Nevada; its watershed is the greatest in area of any of the Valley counties. From this great watershed flow of the Kaweah, St. Johns, Tule, and White rivers, while in the northeastern section the Kern River has its headwaters and flows south through the county into Kern.

Railroad facilities.

The county is traversed by both the Southern Pacific and Santa Fe systems with their main lines and branches. The Visalia Electric

Railroad is in operation between Visalia and Redbanks, via Farmersville, Exeter and Lemon Cove.

Agriculture.

The soil, climate, and water conditions of the valley are suitable for alfalfa and grain. Dairying is, therefore, a very profitable industry. The soil in the foothills east of Porterville, Lindsay, Exeter and Visalia is a red adobe strongly impregnated with iron, making it valuable land for citrus fruit culture. This business in Tulare County has outstripped all other industries, and it is stated to have the largest citrus acreage of any county in the state.

The fruit in this belt ripening a month to six weeks earlier than that in southern California, the soil and climate can not be exceeded for the production of deciduous fruits of all kinds.

Stock raising is a very profitable and growing industry, owing to the extensive ranges of fine grazing land in the foothills and mountains.

Hydroelectric power plants.

Mount Whitney Power and Electric Company. The plants of the Mount Whitney Power and Electric Company derive their water supply from two distinct watersheds of the western slope of the Sierra Nevada Mountains. These comprise the East, Middle, and Marble forks of the Kaweah River, and two forks of the Tule River. The former watershed is the more northerly, has an area of 250 square miles and its elevation ranges from 2600 to 12,400 feet at its eastern boundary. The latter watershed has an area of 88 square miles and its elevations rise over 10,000 feet. A characteristic of both watersheds is the rapid fall of the river-beds. This will amount to 300-400 feet to the mile, and follows the general precipitous nature of the rugged country. Above 4000 feet a heavy covering of snow is found throughout six months of the year, and at the extreme altitudes much snow remains the year round. The water flow during the melting time is necessarily large. The precipitous cañons afford little possibility for the construction of reservoirs. A number of small natural lakes have been increased by the construction of dams, and these serve to augment the low water flow.

KAWEAH PLANT NO. 1. This power house is on the south bank of the Kaweah River, about two miles below the junction of the Middle and East forks, and is about 4 miles east of the town of Three Rivers. The power house building is constructed of galvanized corrugated iron. Within the building are three main generating units and two exciter units. The generators are Westinghouse, 3-phase, 450 k. w., 440 volt, revolving armature machines operating at 450 r. p. m. There are four Westinghouse oil-insulated and self-cooled raising transformers, each having a capacity of 500 k.w.

The plant has its diversion in the East Fork of the Kaweah about five miles above its junction with the Middle Fork where about 20 cu. ft.

per second flow is available during the season of low water, storage being secured from several natural lakes in the high Sierras. These include Lady Franklin Lake, impounding 23 million cu. ft. of water, Silver Lake, Eagle Lake, and Monarch Lake, whose estimated storage is 21 million cu. ft. The diversion is at the outlet of the natural basin where a small, granite masonry dam maintains the water level for the intake of the conduit. A 50-foot tunnel through a jutting rock spur delivers from this basin to a timber flume. This flume has a capacity of 17 cu. ft. per second and is 30,000 feet long, following the very precipitous mountain side of the south slope of the cañon. The flume is 3 feet wide by 2 feet deep with a grade of 20 feet to the mile. The plant is served by a pressure pipe 3300 feet long. The pipe has a diameter at the top of 24 inches, and the thickness is No. 12, B. W. G., with lap-riveted construction. As the pipe descends, the diameter decreases to 23, 22, 21 and finally 20 inches, of which diameter the last 1,160 feet is in lap-welded pipe. The thickness at the power house is $\frac{1}{2}$ inch. The pipe line terminates with a section parallel to the power house building in which are placed 3 cast steel branch fittings. From these connection is made to each water wheel nozzle. The static head on this line is 1310 feet.

KAWEAH PLANT NO. 2 is across the river from No. 1 plant and about a mile below it. This is the only plant on this system that may be termed a low-head installation, the static head of the pipe line being 351 feet. The diversion is in the Middle Fork about one mile above its junction with the East Fork. This diversion was made at a natural dam site, between two granite ledges and consists of a low granite masonry dam whose maximum height is 8 feet. At the west end is the intake for the canal, in which are four hand-operated sluice gates, each 2 ft. 5 $\frac{1}{2}$ in. wide by 6 ft. 6 in. high. The canal follows the hillside for a distance of four miles, of this, 3.15 miles is in a concrete-lined ditch. The remainder is divided into several sections of timber flume. This conduit had a capacity of 80 cu. ft. per second. The ditch is 4 $\frac{1}{2}$ ft. wide at the bottom and 11 $\frac{1}{2}$ ft. at the water surface with a depth of 3 $\frac{1}{2}$ feet. The grade is 5.28 ft. to the mile. At the lower end is a set of 5 sliding gates to allow the water to pass into the head of the pressure pipe line. The elevation of the intake of this canal is 1400 feet. The pipe line has a total length of 1000 feet, and a single diameter of 40 inches. There are three branches in this final section of the pipe, which supply water to the three generating units originally installed in the plant.

This plant consists of a General Electric 500 k. w. 2300-volt 3-phase revolving field generator, operated at a speed of 450 r.p.m. It is direct connected to a Victor-Girard type turbine, controlled by hydraulic-operated gate valve. A General Electric 1500 k. w., 2300-volt, 3-phase

generator operating at a speed of 720 r. p. m., is direct-connected to a Pelton-Francis turbine, having a capacity of 2250 h. p. There are two General Electric 4-pole, 125 volt, 30 k. w., exciters, which operate at 1050 r. p. m. These are direct-connected and driven by Platt Iron Works Girard type turbines. There are seven Stanley G. I. 350 k. w. oil insulated raising transformers.

KAWEAH PLANT NO. 3. The power house is located directly above the intake of No. 2 plant, so that its discharge is caught behind the dam of No. 2 and immediately diverted into that canal. No. 3 plant derives its water from two diversions, one in the Middle Fork, about $\frac{3}{4}$ of a mile from the junction of the Marble Fork, while the other is in the Marble Fork, about the same distance from the junction already mentioned. The canal is carried along the north bank of the Marble Fork above the junction of the two branches, then an inverted siphon, which is a steel pipe 48 inches in diameter, carries the flow from the Marble Fork diversion across the Middle Fork to the point where it joins the main canal. Where the pipe crosses the bed of the Middle Fork, it is buried in solid concrete. The length of this inverted siphon is 1085 feet, and the maximum static head is 125 feet. The waters of the two branches are thus mingled, and are then carried in a continuation of the Middle Fork conduit, which follows the east slope of the Middle Fork to a terminus in a forebay reservoir for the No. 3 power house. The total length of this concrete conduit, including both branches, is 25,000 feet. Of this 5000 feet comprises the section from the diversion in the Marble Fork, including the inverted siphon. The Middle Fork branch is 3300 feet long. The remainder is the conduit from the junction to the forebay reservoir. The Marble Fork and main sections are built upon a grade of one foot in 1000 feet. Of this 6000 feet is in a concrete-lined ditch having a bottom width of 6 feet, and a depth of 4 feet. The remainder of this branch is in slab bench construction of which 12,700 feet is in single slab construction, and 3000 feet in double slab construction. That part of the main canal which receives its water from the diversion in the Middle Fork to the point of juncture with the siphon from the Marble Fork, is built on a grade of 2 feet in 1000 feet. This section consists of 3300 feet of concrete flume, having a width of 6 feet inside and a depth of 2 feet. The forebay reservoir at the terminus of the line, has a capacity of $11\frac{1}{2}$ acre feet. Intake from pressure pipe line is direct from forebay reservoir to power house. Total length of pressure pipe is 2589 feet. Diameter at top is 40 inches and is reduced to 36 inches; at which size it enters the power house. The total static head is 776 feet. The power house is a reinforced concrete building 50' x 50' inside measurements. This plant consists of two 1750 k.w., 2300 volt, 3 phase, Westinghouse generators, direct-connected to Pelton-Doble impulse wheels operating under a head of 776 feet.

TULE RIVER POWER PLANT is situated $1\frac{1}{2}$ miles above Springville. The water supply is secured from the Nelson and Doyle forks of Tule River. The main conduit follows the north slope of the Tule River Cañon to a point where the river makes a bend to the north. The line itself is composed of 23,600 feet of wooden flume, 11,206 feet of concrete-lined ditch and 228 feet of concrete flume. The total length of the conduit is 6.9 miles. At the terminus of the canal is a small regulating reservoir with a capacity of 17,500 cu. ft. The pressure pipe line to the power house enters the forebay reservoir and is carried from the reservoir directly down the hillside to the power house. The total length of pipe is 2814 ft. The power house contains two 1000 k. w. 2300 volt, General Electric generators, driven by Doble wheels, operating under an 1130 ft. head. An auxiliary steam station, having a capacity of 6750 k. w. is located at Visalia.

Bibl.: Journal of Electricity, Power and Gas, Vol. XXXI, "System of Mt. Whitney Power and Electric Company," by R. W. Van Norden.

San Joaquin Light and Power Company. The plant is situated at the junction of the Nelson and Doyle forks of the Tule River. The water supply is obtained from the Doyle Fork by means of a concrete-lined tunnel and flume, 6 miles in length. With a high head of 1425 feet this plant has a capacity of 2000 k. w.

Mining conditions.

Tulare County continues to be the most important source of magnesite in this country. On account of the difficulty in securing imports of magnesite from European countries, the demand for California magnesite has been very active during 1915 and 1916, the result being that there has been a great revival in mining this mineral, and a large tonnage is being shipped from Porterville, Lindsay, and Exeter.

There has also been a renewal of mining activity in the Mineral King and White River districts.

MINERAL RESOURCES.

Tulare County's mineral resources consist of asbestos, brick, clay, chromite, copper, feldspar, gold, graphite, gems, infusorial earth, lead, limestone, magnesite, marble, natural gas, quartz, glass sand, silver, soapstone, miscellaneous stone, and zinc.

ANTIMONY.

Lady Alice Mine. Situated $\frac{1}{4}$ mile south of Mineral King, on slope of ridge west of East Fork of Kaweah River. Vein of quartz slightly mineralized with antimony sulphide strikes N. 10° W. and dips 50° W. Width of vein is 2 feet. The formation is slate. Several shallow prospect holes have been sunk along the outcrop of the vein. Idle, Arthur Crowley of Mineral King, owner.

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ASBESTOS.

In the serpentine area east of Porterville are some small deposits of asbestos, none of which are of commercial value. One deposit is on the McCann Ranch, 1 mile south of White River. On the James Ranch north of Porterville there is a deposit of fair grade asbestos. Asbestos, but not of the best quality, is obtained in Frazier Valley in T. 20 S., R. 29 E., on Tule River, 25 miles east by south of Tulare City.

CLAYS.

South of Porterville there is a large deposit of fire clay, which from tests made is reported to produce a fine quality of fire brick.

In the neighborhood of Exeter and Visalia are extensive deposits of brick clays.

Sear's Clay Deposit is situated 8 miles southeast of Ducor, in Secs. 26, 27, 35, T. 24 S., R. 28 E. The clay bearing strata extend about $\frac{1}{2}$ mile south of White River and about 2 miles in length along the south



Sear's Clay Deposit, 8 miles southeast of Ducor. Showing 8-foot overburden of clay and gravel.

bank of the river. An overburden of gravel and clay 6' to 8' thick overlies a bed of white and blue plastic clay. A number of small cuts have been made along the south bank of the river. These pits show a white clay 6' to 8' thick overlaying a blue plastic clay. The strata of the clay beds have a general northwest-southeasterly strike. The development of this deposit has been only superficial, so the depth of the clay beds has not been determined. The clay is suitable for tile, sewer pipe, fire brick, vitrified brick and terra cotta. W. A. Sears, of Porterville, owner,

Pioneer Brick Company. John Etzenhouser, president; Arthur Etzenhouser, secretary. The plant is located on Mill Creek, near the eastern limits of the city of Visalia. The bricks are made in a soft mud machine, seasoned in racks and burned in field kilns, using oil as fuel. Most of the output consists of common red brick, but a few pressed brick are made each year. Capacity of plant is 40,000 brick per day.

S. P. Brick Company. W. D. Trewitt, president; L. E. Hayes, secretary and general manager; office, 435 Powell Bldg., Fresno. The plant is located $\frac{3}{4}$ of a mile south of Exeter, in Sec. 14, T. 19 S., R. 26 E. The deposit covers an area of 20 acres. About a couple of acres have been worked by pits, showing a good quality of brick clay for a depth of 15 feet. The material from pits goes to a Scott-Madden pulverizer, the product after being pulverized is elevated and screened over a piano wire screen.

The screened material goes direct to pug-mill, then to stiff mud machine, which has a capacity of 55,000 bricks per 9-hour day. From the latter machine the material is fed to a board delivery cutting table. The bricks are dried and burned in Steward & Clamp open kilns, using oil as fuel. Yearly capacity of plant is six million bricks. Most of the output consists of common red brick.

Shale.

Valencia Heights Shale Deposit. Six miles east of Porterville, in Sec. 34, T. 21 S., R. 28 E., a strata of clay shale about 1500' to 2000' in. width cuts through the serpentine belt east of Porterville. The strike of these shale beds is NW.-SE. with dip of 75° NE. The outcrop can be traced easily on the surface and shows up plainly, where it is cut by an irrigation ditch and also by the county road. The quality appears good for the manufacture of brick, sewer pipe, tile and conduits. The following analysis was made by Smith Emery Company, of San Francisco:

Silica	68.52%
Alumina	16.04%
Iron oxide	4.00%
Lime	0.58%
Magnesia	2.35%
H ₂ O	1.78%
Ignition loss of 3.02%.	

C. H. Weed, of Porterville, owner.

CHROMITE.

In the foothills north and southeast of Porterville a number of deposits of chromic iron of good commercial grade have been developed and worked out during the past year. The ore occurs in lens-shaped deposits in the serpentine, and as a rule are small and of shallow depth.

The most extensive deposit was on the Vaughan Ranch, north of Deer Creek from which about 800 to 1000 tons of good grade chrome ore was extracted and shipped.

Bowlin Chrome Mine. Lee Bowlin, Exeter, owner. In Sec. 20, T. 19 S., R. 27 E., 4 miles north of Lindsay. A series of small lenses of chromite occurred in the serpentine. The general strike of these lenses was northwest and southeast. About 100 tons of ore has been shipped from these deposits. The deposits have been worked out.

James Chrome Mine. Mrs. J. H. James, Porterville, owner. In Sec. 11, T. 21 S., R. 27 E., 4 miles north of Porterville. A lens of chromite occurred in the serpentine, 161 tons of ore of good quality was shipped from this property.

Sattlefield Chrome Mine. Lee Bowlin, of Exeter, owner. In Sec. 20, T. 19 S., R. 27 E., 6 miles northeast of Lindsay. Property under lease to E. L. Sattlefield and Bros. of Lindsay. In foothills northeast of Lindsay, a series of narrow lenses of chromite have been discovered in the serpentine, which strikes northerly and southerly. The width of ore developed varies from 2' to 5'. Two open cuts have been made, and about 75 tons of ore extracted. The quality of the ore is very good.

Vaughn Chrome Mine. D. A. Vaughn, of Porterville, owner. It is 4 miles southeast of Porterville. On the south slope of ridge north of Deer Creek, two large sized lenses of chromite were developed and extracted. One was at an elevation of 650 feet on south slope of hill. The general strike of this lens was N. 20° W. In extracting the ore an open cut 100' in length, 25' wide and 15' deep was made. About 300' north of this lens at an elevation of 880', an open cut and tunnel was driven on a large deposit of chromite which had the same general strike as the lower lens. The open cut is 150' long by 12' wide by 10' deep. On the same general strike of these lenses, at an elevation of 1050 feet and about 1000 feet north of No. 2 workings, occur two small lenses of ore. On the top of this ridge the indications look encouraging for the occurrence of small lenses of chromite. Reported that 800 to 1000 tons of ore was shipped from this property during 1916, which averaged 45%. The shipments were made by California Magnesite Company of Porterville, which has a lease on the property.

Waddell Chrome Mine. Frederic Gill, Exeter, owner. Under lease to H. G. Waddell and F. R. Brann of Lindsay. Situated in Secs. 17, 20, T. 19 S., R. 27 E., 4 miles northeast of Lindsay. A series of narrow lenses of chromite occur in a belt of serpentine in foothills northeast of Lindsay on the Gill ranch. The general strike of these lenses is N. 40° E. One mile north of the main deposit on an adjoining hill at an elevation of 800 feet, a series of narrow lenses occur which have the same general strike. The serpentine belt strikes northwest and south-

east. About 70 tons of chrome ore of good quality was shipped from the property during 1916.

COPPER.

In this county, there are some very promising copper prospects, but owing to the ruggedness of the country and their distance from transportation they have been but little explored and only slightly developed. Just east of Porterville, there is an area of country fully five miles wide, and which extends north to the Yokohl Valley, in which small veins occur. This belt is most clearly defined and characterized by narrow diverging seams or stringers of copper-bearing minerals. The chief deposits are near the middle of the county, thirty miles or so east of Porterville, along the North Fork of the Middle Fork of the Tule River. Copper prospects of possible future value occur high in the Sierras located close to Kearsarge Peak, in the extreme northeastern corner of the county.

Annie Fox Mine. Situated in the Mineral King mining district, on the west slope of ridge east of the East Fork of Kaweah River. The following claims have been located in alternating strata of uptilted limestones and slates which are bent, crushed and twisted: Annie Fox, Gray Wolf, Galena Boss, Galena Boss Extension, Annie Fox Extension No. 1, Annie Fox Extension No. 2.

The ore zone occurs on contact between the limestone and slates and is from 5' to 20' wide, covered with an iron gossan capping. A series of prospect shafts and short tunnels have been driven along the outcrop. The ore occurs in the form of chalcopyrite associated with iron sulphides. The general strike of the veins is N. 30° W., with a dip of 70° NE. W. O. Clough and Judge W. B. Wallace, of Visalia, owners.

Barber Mine. Dr. Barber and Frank Witt, of Porterville, own some claims, on ridge south of North Alder Creek, 18 miles northeast of Springville. The ore zone occurs on contact of granodiorite and porphyry, which is mineralized with chalcopyrite and iron sulphides. The strike of the vein is east and west. There is a tunnel 50 feet long and a series of shallow open cuts on the vein.

Hamilton Mine. Situated on the Hamilton ranch, in Sec. 33, T. 18 S., R. 27 E., 5 miles east of Lindsay. Kidneys and stringers of copper ore occur along a shear zone in a formation of mica schist. This mineralized zone strikes NW.-SE. and dips 75° NE. A shaft has been sunk to a depth of 110 feet, on an angle of 75°. At the bottom of shaft the mineralized zone was crosseut for a distance of 10 feet on each side of shaft. The ores are oxides and carbonates. Idle. Jas. L. Hamilton, of Yokohl, owner.

Lion's Nest Mine. Situated in the Mineral King mining district, to the south of the Annie Fox Mine. Ore occurs on contact with limestones and slates in a belt of uptilted strata of limestones, slates and shales. The strike of this belt is N. 10° W. with a dip of 70° NE. A crosscut tunnel was driven 400 feet to cut the contact, but work was suspended before reaching that point. Mouth of tunnel covered with a slide. Idle. P. L. and M. E. Bozeman, of Exeter, owners.

Copper Mountain Mines. In Secs. 34 and 35, T. 14 S., R. 31 E., near Kearsarge Peak, there is a mineral-bearing belt a mile wide, running northeast and southwest. The ores are sulphides and carbonates, carrying from 2% to 25% copper. The deposits in the richer veins of this belt are opened by shaft 18' deep, a tunnel 50' long and an open cut 5' deep, on the east side of Roaring River. On the west side there is an old shaft and drift. At the head of Cloudy River Cañon close to the Copper Mountain mines, there are some cuts and a tunnel 40 feet long. Quartz shows strongly in this tunnel. The decomposed limestone carries gold. The shaft shows a 3-foot ledge of carbonate ore. The vein matter is schist, diabase, and amphibolite. The claims are 1000 feet above timber line.

Bibl.: Bull. 50, p. 292.

Oakland Copper Mine. Eight claims have been located at the headwaters of Copper Cañon, about 12 miles north of Mineral King. A mineralized zone 80 feet wide occurs on the contact of limestone and syenite-granite. This zone strikes north and south. On the Oakland claim a shaft has been sunk on the contact to a depth of 80 feet, and a tunnel 70 feet in length driven on contact. In the mineralized zone on the Amador claim there is a tunnel 30 feet long and a series of open cuts five feet deep, which prove the zone to be mineralized for a width of 80 feet. The ores are bornite, chalcopyrite, associated with iron sulphides. Idle. D. Dawson, K. S. Castle, R. Weismer, and W. J. Martin, of Voleano, Amador County, owners.

Page Mine. It lies in a low ridge of hills, 7 miles NE. of Visalia. The vein is 4 feet thick and is filled with siliceous matter, impregnated with copper pyrite. Idle. J. Prothers, of Visalia, owner.

Bibl.: Reports XII, p. 297, and XIII, p. 64.

Powell Copper. Situated in Secs. 30, 32, 5, T. 19 and 20 S., R. 31 E., on the North Fork of Middle Fork of Tule River, 16 miles northeast of Springville, at an altitude of 5,100 feet. The ore occurs on contact between limestone and granite and schist. The immediate country rock consists of schist, quartzite, diorite and quartz porphyry. The ore-bearing limestone is about 250 feet in width. The sulphide ore bodies exposed are from 5 to 30 feet in width. There are three tunnels, and two shafts; one tunnel 70 feet long crosscuts 5 feet of ore. A crosscut

tunnel 175 feet long cuts 30 feet of low grade sulphide ore near the mouth, the remainder of the distance in slate and limestone. On the east bank of the river a tunnel has been driven crosscutting 20 feet of 5% copper ore. On the west bank of river, a tunnel has been driven parallel to limestone contact, a distance of 45 feet, showing 15 feet of sulphide ore, and a winze has been sunk to a depth of 15 feet all in ore.

The course of the vein is northeast and southwest. The ores are chalcopyrite, pyrrhotite, sphalerite, associated with iron sulphides, carrying from 2% to 5% in copper, with gold and silver values. The ore occurs in an actinolite, hornblende and feldspar gangue, which is very hard. The holdings consist of seven mining claims located along the contact in a northerly and southerly direction. Three men are employed on development work. Mrs. Monte Powell, L. M. Powell and R. G. White, of Visalia, owners.

Bibl.: Bulletin No. 50, p. 290.

Round Valley Mine. It is a prospect situated on C. H. Cannon's ranch, on a small hill in Round Valley, $2\frac{1}{2}$ miles east of Lindsay. The ore occurs on a serpentine and granite contact. A small vein occurs on this contact carrying oxidized ores with a little bornite and chalcopyrite. A shaft is being sunk on this vein. Three men are employed. Under lease to Frank Childs and W. R. Livingston, of Lindsay.

GEMS.

At different places all along the foothills of the Sierra Nevada, across Tulare County, chrysoprase outcroppings occur; and associated with it are a number of other forms and varieties of siliceous minerals capable of use in the arts for ornamental purposes, such as rose quartz, chrysopal, etc., besides several species of garnet. Another interesting stone found in this section, on the borders of Tulare and Fresno counties, named *californite*, is a compact green variety of vesuvianite, that perfectly resembles the celebrated ornamental stone known as jade, so much prized in the Orient for elegant art work. Chrysoprase has been found and mined in the following locations: Venice Hill, Stokes Mountain, Tule River, Deer Creek, and one mile east of Lindsay.

In the past a very active interest was taken in mining chrysoprase, but of late years there has been less demand than formerly because the stone is not now the fad in jewelry that it was at one time. Chrysoprase was first discovered in Tulare County in 1878 by Mr. Geo. W. Smith, of Visalia. Deposits of feldspar occur at Three Rivers. Rose quartz of fine quality and suitable for making ornaments, is found in Yokohl Valley. The **Summer Rose Quartz Claim** of W. D. and George W. Parson is about 8 miles southeast of California Hot Springs, near the Kern County line. Beautiful specimens of rose quartz can be

obtained from this prospect.¹ Rhodonite has been found near Lemon Cove.²

Deer Creek Chrysoprase Mine. Situated in Sec. 20, T. 22 S., R. 28 E., 5 miles southeast of Porterville. On a small hill south of Deer Creek are found some narrow veins of chrysoprase 2" to 3" thick occurring in a jaspery rock. Much of it was evidently flawed but a great deal of choice material has been taken out. The color varies from greenish to blue, some of it being a beautiful light green. Workings consist of three open cuts on the south slope of the hill; the main open cut is 150' long by 30' deep. The top of hill is covered with a massive outcrop of jasper, in which seams of chrysoprase occur. Idle. T. T. Sullivan, Tulare, owner.

Stokes Mountain Deposits. Small seams of chrysoprase occur in a red jasper rock on Stokes Mountain in Secs. 9 and 10, T. 16 S., R. 26 E., 3 miles southwest of Auckland.

Venice Hill Deposits. Situated 10 miles northeast of Visalia in Secs. 4, 5, and 8, T. 18 S., R. 26 E., outcroppings of chrysoprase extend along the southeastern slope of Venice Hill and through Secs. 8, 4, and 5. Here it occurs in small irregular veins, which range from mere seams to veins of two and three inches in thickness in a somewhat altered red jasper.

FELDSPAR.

Carter Deposit. There is a deposit of feldspar $\frac{1}{2}$ mile east of Three Rivers, on the ridge east of the Kaweah River, about 12 miles from the railroad. White crystals of orthoclase occur in a pegmatitic granite in seams and kidneys 6" to 18" in width. In the past quite a tonnage was shipped from the property. Idle. F. M. Carter, of Three Rivers, owner.

On the **Britton Ranch** at Three Rivers in Secs. 23, 24, 25, T. 17 S., R. 29 E., there are a number of massive croppings of feldspar of good quality. No development has been done on the property owing to the distance from railroad transportation. Mrs. Eureka Williams and Mrs. Nellie Britton, owners, care Noel Britton, Three Rivers.

Goodale Deposit. C. E. Goodale of Lemon Cove, has been shipping feldspar from his deposit near that place, for several years past.

The **Honora Realty Company**, Adolph Levis, president, Visalia, has a deposit of feldspar on NE $\frac{1}{4}$ of NE $\frac{1}{4}$, and SW $\frac{1}{4}$ of SW $\frac{1}{4}$, of Sec. 15, T. 18 S., R. 27 E., M. D. M., $1\frac{1}{2}$ miles from Lemon Cove, which is their shipping point. The product is sold mainly to porcelain manufacturers.

There are some deposits of **feldspar** in the Yokohl Valley, from which shipments have been made occasionally, by leasers and owners,

¹See Mineral Resources of United States, U. S. Geol. Survey, 1911, p. 1062.

²See Mineral Resources of United States, 1911, p. 1063.

among whom may be mentioned: Alvah Joyner, Exeter; C. F. Dougherty, Strathmore; Geo. Gassenberger, Yokohl via Exeter; Fritz Mehrtens, Exeter.

GOLD.

The only productive area where gold mining has been carried on to any extent is in the White River mining district, situated 15 miles southeast of Porterville. Some promising prospects are also being developed on Cow Mountain in Sec. 31, T. 21 S., R. 30 E. In the Globe district, 12 miles east of Porterville, on the Middle Tule River, some prospecting has been done on narrow veins of quartz carrying gold values.

White River mining district.

Geology. The country rock is principally granitic with one or more streaks of crystalline limestone. These streaks have a northeasterly and southwesterly trend. Accompanying the limestone are copper bearing rocks. The auriferous veins traversing the granite are fissure veins and the prevailing dip is northwesterly. In the western portion of the district the veins extend into a formation of micaceous slate with the same general strike and dip as in the granite. The first discovery of gold at White River was made by D. W. C. Biggs and A. J. Maltley in 1853. First location was made as Keys claim. It is reported \$150,000 was taken out of property to a depth of 300 feet. The output of the camp is reported to have been in the neighborhood of \$750,000. Mining operations in the camp were more or less active until 1906, since which date only a small amount of work has been done. During the past year there has been a renewal of mining activity in this camp, and the prospects appear bright for the reopening of the Bald Mountain, Eclipse, Josephine and Last Chance mines.

Bald Mountain Mine (Quartz). It is $1\frac{1}{2}$ miles southeast of White River, at 2,000' altitude. Holdings consist of the following claims: Bald Mountain, Richelieu, Ninety-nine, English, Keys, Bald Mountain Extension, Keys Mill site, Gold Nugget Placer mine, controlling 220 acres, with 6780 feet on the lode. The Bald Mountain vein is a true fissure cutting the granite. Strikes E.-W. and dips 80° N. Width varies from 14" to 4', with 4" to 12" of pay ore. With the same general course there is a series of narrow parallel veins to the main Bald Mountain vein. There are two shafts on the property: Bald Mountain shaft, 262 feet deep, and Keys shaft has been sunk to a depth of 200 feet. The principal workings are from the former shaft. Three levels were driven from this shaft on the vein at depths of 157', 190' and 257'. On the 157' level a drift has been driven 200' east of shaft, on the 190' level there is a drift 200' east; on the 257' level, drift 220' east. South of shaft a crosscut tunnel has been driven north 400' to vein, which it cut 100' east of shaft, and the vein was drifted on 1,700' to the west.

This tunnel intersected the shaft at a depth of 120'. From the tunnel level the ore has been stoped at intervals to surface. The ore is free milling with 2% pyrite, and is reported to have values from \$12 to \$40 per ton. Equipment: 2 compartment vertical shaft (4' x 4') (4' x 4'), 30 h. p. boiler, 25 h. p. single drum hoist. Idle. W. Tate Young, Corinth, Mississippi, owner.

Bibl.: Report XII, p. 295; XIII, p. 469.

Barton Mine (Quartz). It is on Rattlesnake Creek, 2½ miles west of Auckland, at an elevation of 1600 feet. The vein is 3 feet wide, and consists of a mineralized zone with free gold in a decomposed granite. It strikes N.-S., and dips 75° E. The development consists of two tunnels, No. 1 is 350 feet long and a winze has been sunk on the vein from this tunnel to a depth of 100 feet; No. 2 tunnel has been driven on the vein for a distance of 220 feet. Idle. H. B. Barton, of Auckland, owner.

Bibl.: Report XII, p. 295; XIII, p. 469.

Cherokee Mine (Quartz). It is 2 miles southeast of Mineral King, on ridge east of the East Fork of Kaweah River, at an elevation of 10,600 feet. Vein strikes NW.-SE., dips 60° NE., width 12 inches. The vein carries arsenical pyrites, reported to carry high gold values. There is a shaft 20 feet deep, and a tunnel 25 feet long. Idle. Arthur Crowley, of Mineral King, owner.

Creeks Mine (Quartz). It is situated on the northeast slope of Cow Mountain, 13 miles east of Porterville, at an elevation of 2680 feet. A series of narrow parallel veins of quartz occur in granite, striking N. 45° W., and dipping 40° SW. The veins have been prospected by a number of short tunnels and shallow shafts. One man employed. Robert Creeks, of Porterville, owner.

Eclipse No. 2 Mine (Quartz). Situated 2½ miles southwest of White River, at an altitude of 1,750 feet. Holdings: Eclipse No. 2, Eurilda, Willie T., Gray Eagle, and Hillside Millsite, all patented claims; with a length along the lode of 5000 feet. There are two parallel veins: Eurilda and Eclipse, most of the development having been done on the latter. The vein strikes N. 70° E. and dips 60° NW. The Eclipse vein is 2 feet wide with 8" to 12" of quartz. The vein occurs in granite east of shaft and at the shaft it passes into a micaceous slate, which is the formation to west of shaft. The vein is strong and continuous in both the granite and slate.

At a depth of 620 feet the vein is faulted 27 feet to the south. The ore is free milling with 2% iron-sulphides. The mine has been developed by a series of tunnels and a shaft 700 feet deep, sunk on an angle of 60 degrees. East of shaft, a crosscut tunnel was driven 100' to vein, then drifted on the vein 215' west, intersecting incline shaft at

a depth of 200'. At a depth of 260', a level was driven 90' east, which shows 2' of ore in face. On the 700' level, a drift was run 80' east and 50' west, in the east drift there is 3' of quartz. The ore has been stoped out from tunnel level to surface and is reported to have milled from \$12 to \$20 per ton. Equipment consists of a head-frame, blacksmith shop and tools. Idle. W. Tate Young, Corinth, Mississippi, owner.

Bibl.: Report XII, p. 296; XIII, p. 470.

Florence G. Mine (Quartz). It is located on the northeast slope of Cow Mountain, in Secs. 30, 31, T. 21 S., R. 30 E., 14 miles east of Porterville, at an elevation of 3300 feet. Holdings: Florence G., Florence G. Millsite, and Black Bear group. Series of parallel, true fissure veins occur in granite. The veins strike N. 45° E. and dip 35° E.; width 12". The quartz is free milling with 2% iron sulphides. There are two tunnels on Florence G. claim; one is 140 feet long, the other 150 feet long. The ore is treated in an arrastra. Two men employed. E. J. Garvin, of Porterville, owner.

Homestake Mine (Quartz). It is 2 miles southwest of White River, at an altitude of 1200 feet. Property has been taken up as a homestead. J. McCann, of White River, owner.

Bibl.: Rep. XII, p. 297; XIII, p. 570.

Josephine Mine (Quartz). Situated 3 miles northwest of White River, in Secs. 31, 32, T. 24 S., R. 29 E., at an elevation of 1580 feet. Holdings consist of 200 acres of patented mineral land. Claims: Josephine, Last Chance, Royal, Gold Dollar, Margaret, Josephine Extension, Jackson, Woody, New York and Kentucky; with 4500 feet on the lode. The Josephine and a series of parallel veins strike N. 70° E., dipping 55° NW., occur in a micaceous slate. The only extensive development has been on the Josephine vein. On this vein an incline shaft has been sunk to a depth of 300 feet, on an angle of 55°. Three levels have been driven on the vein at depths of 100', 200' and 300'. On 100' level drift E. 200 feet, W. 200'. On 200' level drift E. 100' and W. 100'. On 300' level drift E. 40 feet and W. 36'. The vein shows an average width of 4' of quartz. It is free milling with 2% iron sulphides and some galena. Ore reported to have assay value of \$13.00 per ton. Only small amount stoped. Equipment: 16 h.p. Union gas engine, single drum hoist, 20 foot head-frame. There is a pumping plant on the Woody claim 4500 feet southwest of mine. Water was pumped from three wells 18 feet deep by 12 h. p. Fairbanks-Morse triplex pump, and Rumsey 4 x 4" triplex pump through 1½" pipe line to mine under a lift of 320 feet. Idle. W. Tate Young, Corinth, Miss., owner.

Last Chance (Redfield) Mine (Quartz). Situated two miles west of White River, on the east bank of White River, at an elevation of 1000

feet. The vein is a true fissure in granite. Strikes E.-W., dipping 80° N.; width is 4 feet. The ore is free milling with 2% iron sulphides. The developments consist of a vertical shaft 265' deep; with levels at 100', 200' and 265'. Equipment: 2-compartment shaft (4' x 4') (4' x 4') 20 foot head-frame, 30 h. p. boiler and 15 h. p. steam hoist. Idle. Redfield Mining Company, 1001 Mills Bldg., San Francisco, owner.

Bibl.: Rep. XII, p. 297; Rep. XIII, p. 470.

Minnie Ellen Mine (Quartz). Situated 8 miles southeast of Porterville. In Sec. 9, T. 23 S., R. 28 E. Vein strikes NW.-SE. in granite. Dip vertical. Width 5 feet. Shaft 123 feet deep. Idle. Truman Hart and John Hoxey, Fresno, owners.

Sandstone Mine (Quartz). It is situated on Blue Mountain, four miles southeast of White River. The ore occurs along a sheer zone in a quartz-granite, which strikes N. 75° E., dipping 75° NW. Width of mineralized zone being 4 feet. Three shafts from 25' to 50' in depth have been sunk on the vein. Two men employed. Henry Moore, of White River, owner.

Stencil Mine (Quartz). It is 1½ miles west of White River, at elevation 1150 feet. The vein strikes E.-W., dipping 80° N. Width 8 inches. The formation is granite. A tunnel driven 300 feet east on the vein. There are also a number of shallow shafts and open cuts along the outcrop. The ore was milled in an arrastra. Idle. John Flor, of Glenville, Kern County, owner.

Bibl.: Rep. XII, p. 298; Rep. XIII, p. 471.

Sunset Mine (Quartz). Situated 3 miles southwest of White River. A vein 12" in width occurs in the slate, strikes N. 70° E. and dips 55° NW. Developments consist of a number of tunnels and shafts, the most extensive being a tunnel 175 feet long. Idle. Mike Mitchell, of Ducor, owner.

Bibl.: Rep. XII, p. 298; XIII, p. 471.

GRANITE.

In the foothills east of Porterville and Exeter there are extensive deposits of biotite-granite, which are suitable for building purposes. Up to the present time only a small amount of development has been done on these deposits.

California Granite Quarry. California Granite Company, 518 Sharon Bldg., San Francisco, owner; president, A. Pernu; secretary, A. Bocci; general manager, H. Beck. The quarry is situated 4 miles east of Porterville, in Sec. 27, T. 21 S., R. 28 E. Holdings consist of 100 acres. The biotite-granite is of medium coarse grain. Has a fairly straight cleavage and takes a good polish. The rock mass is

intersected by a great number of joint planes, hence does not occur in large dimensions, but blocks large enough for ordinary building purposes are obtained. The supply of granite is practically unlimited. Two quarry faces have been opened up on the southwest slope of the



Number 1 Quarry of California Granite Company, situated 4 miles east of Porterville.
Photo by Walter W. Bradley.

hill. The general strike of the granite formation is NE.-SW. It is about one mile in width with serpentine on both sides. The rock weighs 180 lbs. to the cubic foot. The company also has a lease on 10 acres from C. A. Witt, on the Success and Porterville road where a small quarry has been opened on a diorite, locally called "black granite." Plant: 25 h.p. steam hoist, two derricks (10" x 10"), Ingersoll-Rand compressor, also surfacing and polishing machines and air drills. Twenty-five men are employed.

Rocky Point Granite Quarry. Situated four miles east of Exeter, in Sec. 8, T. 19 S., R. 27 E., D. R. Griffith and R. H. Owen, of Exeter, owners. The granite is a gray, fine-grained rock of very uniform texture and color, which splits readily in any direction and takes a fine polish. It occurs in large detached masses and flattened beds, the pitch of the latter is a little east of north, at an angle of 30°. The beds or layers vary from 2' to 25' in thickness and are so situated that a

face of any required height may be obtained to quarry. The rift appears to be east and west. Any desired size of building stone can be obtained. Idle.

Bibl.: Bull. 38, pp. 55, 56.



Number 2 Quarry of California Granite Company.

GRAPHITE.

Deposits of graphite are found in Drum Valley, 6 miles north of Auckland, in Secs. 4 and 5, T. 15 S., R. 26 E., on the land of William Kincaid, of Dunlap, and another deposit on the Reeves ranch, $3\frac{1}{2}$ miles west of Dunlap.

Bibl.: Rept. XIII, p. 642; Bulletin 38, p. 280.

GYPSUM.

California Gypsum and Mineral Co., J. M. Anderson, Tulare, owner. In Sec. 21, T. 30 S., R. 22 E.

Bibl.: Bulletin No. 38, p. 288.

IRON.

Franklin Cañon Iron Mine. Situated in Franklin Cañon, two miles SE. of Mineral King, at elevation of 10,000 feet. A deposit of pyrrhotite occurs on limestone and granite contact. The mineralized zone is 4 feet in width. T. J. Crabtree, of Porterville, owner.

Lady Emma Mine. It is located in Monark Cañon, two miles SE. of Mineral King, at an elevation of 10,100 feet. A shaft has been sunk on a limestone and granite contact, developing 4 feet of ore. The contact strikes N. 30° W., and dips 80° NE. Along the contact the limestone

is heavily mineralized and the adjoining country rock stained with iron for some distance. W. O. Clough, of Mineral King, owner.

LIMESTONE.

There are extensive deposits of limestone in the foothills and mountainous regions in the eastern part of the county. On the North and South forks of the Tule River there are large belts of limestone which have general northwesterly and southeasterly strike. Extensive deposits of limestone occur in the neighborhood of Three Rivers, and on the Middle, Marble and South forks of the Kaweah River in the Sequoia National Park.

In the Mineral King district at the White Chief mine there is an extensive deposit of crystalline limestone.

Britton Limestone Deposit. At Three Rivers, on the Britton ranch, in Sec. 23, T. 17 S., R. 28 E., a belt of limestone about $\frac{1}{2}$ mile wide strikes across the ranch in a northwesterly and southeasterly direction. The rock is a blue crystalline limestone of good quality. Mrs. Eureka Williams and Mrs. Nellie A. Britton, of Three Rivers, owners.

Gill Ranch Limestone Deposit. In Sec. 13, T. 21 S., R. 28 E., on the Gill ranch, 10 miles northeast of Porterville. On hill north of Tule River there is a massive outcrop of coarse crystalline limestone.

In Sec. 12, T. 22 S., R. 28 E., 8 miles southeast of Porterville, there is a lens of limestone in a granitic rock, which strikes northerly and southerly, dipping at an angle of 60° E. It is a white, coarse crystalline limestone which disintegrates very easily. The lens of limestone is 300' to 500' wide and about 1500' in length. Fred and William Gill, owners, Exeter.

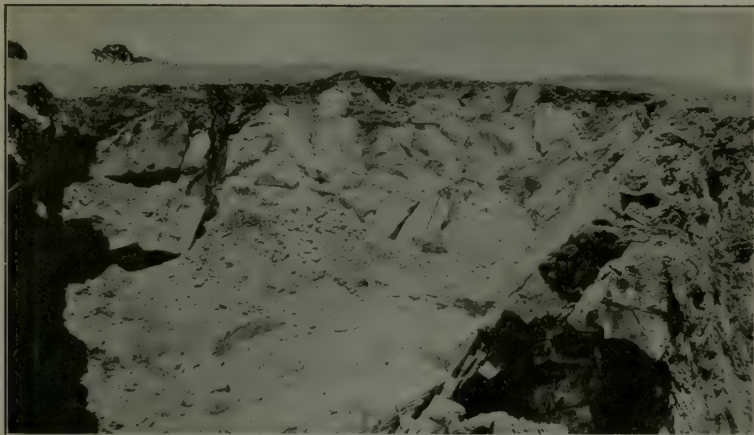
Holdridge Limestone Deposit. It is situated 10 miles northeast of Porterville, on Holdridge ranch, in Sec. 13, T. 21 S., R. 28 E. On hill north of house there is a massive outcrop of coarse crystalline limestone. The belt of limestone is about $\frac{1}{2}$ mile wide, and can be traced for a distance of one mile. It has a north and south course. J. R. Holdridge, of Porterville, owner.

Lemon Cove Lime Quarry. The quarry is situated $1\frac{1}{2}$ miles north of Lemon Cove, in Sec. 35, T. 17 S., R. 27 E. The limestone is a coarsely crystalline calcite and occurs in irregular pockets. The limestone extends for about 40 feet across the face with side walls of clay-shale which dip 65° N. A dike of schistose slate material 4 feet wide extends diagonally across the present face of the quarry. The quarry has a face 50' high by 40' wide.

The broken rock is trammed 100 yards to loading bins. Product is shipped to the sugar refinery at Visalia. Equipment: one (6" x 6") Gardner air compressor driven by 12 h. p. gas engine. Four men are

employed. Carle Roque, of Lemon Cove, owner. Under lease to San Joaquin Valley Sugar Company, Visalia.

Bibl.: Bulletin 38, p. 94.



Lemon Cove Lime Quarry. Near Lemon Cove, Tulare Co. Showing 40 feet of limestone with clay-shale walls.

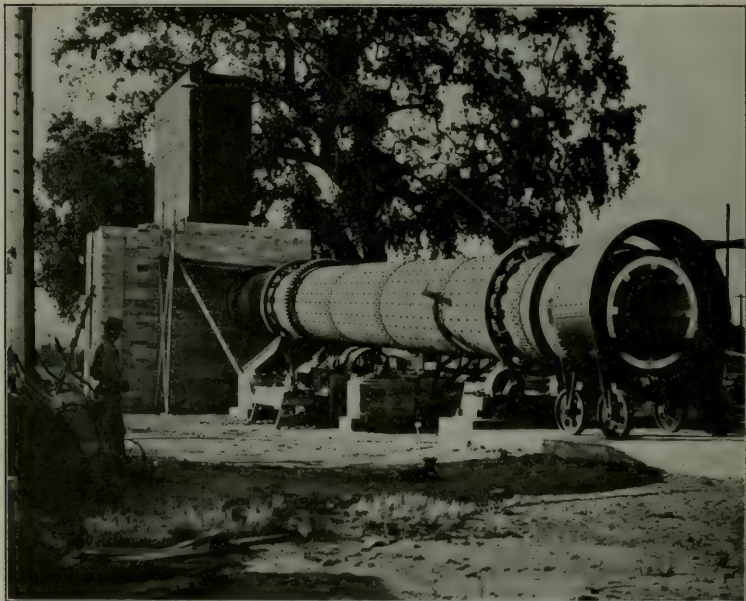
Morehouse Limestone Deposit. It is 14 miles east of Springville, on ridge northeast of South Fork of Middle Fork of Tule River, in Secs. 29, 30, 31, 32, T. 20 S., R. 31 E. Holdings consist of 780 acres. A belt of blue crystalline limestone about $\frac{1}{2}$ mile wide by 7 miles long strikes NW.-SE. The croppings on the north side of the river are very prominent. Along the banks of the river are a number of soda springs from which thick deposits of calcareous tufa were noticed. Some of these deposits are quite extensive and have been developed by shafts and tunnels, showing in places a mass of material deposited by spring action over 100 feet thick. The limestone belt cuts through a formation of mica schist and granite. Riverside Portland Cement Co., 726 Mills Bldg., San Francisco, owners.

James Marble Deposit. It is in Sec. 6, T. 22 S., R. 29 E., 8 miles southeast of Porterville, on road to South Tule Indian Reservation. A dark gray marble is found on James ranch, which is suitable for building purposes.

MAGNESITE.

The entire domestic production of magnesite is from California and during 1915 the production was nearly double that of the highest previous year (*i. e.* 1910). The output of magnesite in Tulare County was in excess of any other county in the state, this county producing 11,574 tons, an increase of 1924 over 1914 production.

Due to the European war, in that ocean traffic with most foreign ports of supply is largely cut off, attention has naturally been directed to the California deposits. So far as quality and quantity alone are

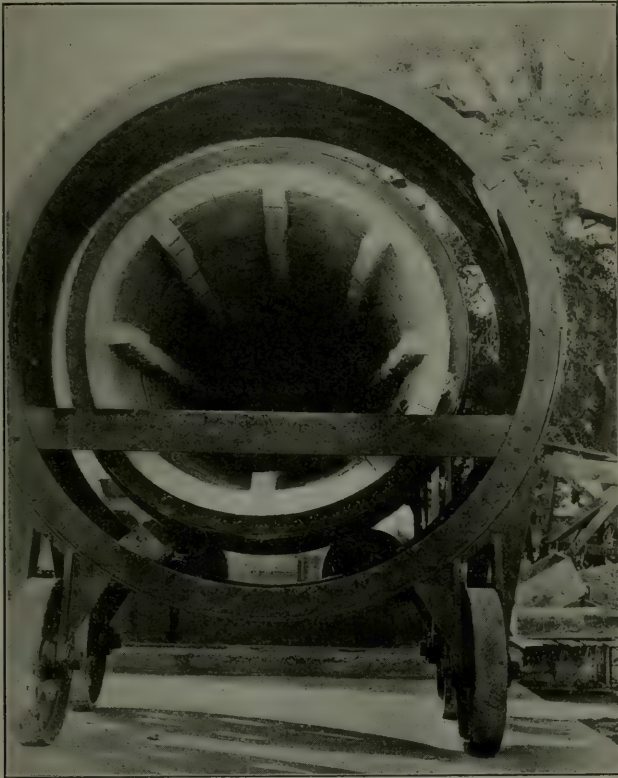


Rotary magnesite calcining kiln of the California Magnesite Co., at Porterville.
Photo by Walter W. Bradley.

concerned, the California deposits, of which Tulare County is the largest producer, might readily supply the demand in this country for the purer grades of magnesite and such as are used for making cement, paints, fireproof and damp proof coatings and in the manufacture of paper and other products, but the California deposits are so far from the principal markets of the country that the overland freight rates prohibit their shipment under ordinary conditions. There has been much speculative inquiry as to California magnesite mines, the result being that a number of new deposits have been opened up in the field around Porterville, Success and Lindsay.

The California Magnesite Company early in 1916 operated several leases in the Porterville district, and commenced the erection of a large calcining plant. Their work was later interrupted by litigation. This plant has been recently purchased by the International Magnesite Company, of San Diego, who plan to complete the construction of the plant and operate on a large scale. The price of crude magnesite

during 1915 ranged from \$7 to \$12 per ton, f. o. b. San Francisco, or other California points. The value for the calcined product was from \$25 to \$30 per ton. The freight rates on magnesite ores from Porterville



Showing lining of rotary kiln for calcining magnesite, adopted by the California Magnesite Co., Porterville. Photo by Walter W. Bradley.

to Atlantic ports was \$11 per ton. The rate on ores from Porterville to San Francisco is \$4 per ton. The freight on magnesite ores from San Francisco to points on Atlantic seaboard through the Panama Canal is \$7 per ton. In addition to the cost at the mine, the local freight rates from the mines to San Francisco have to be considered. The average cost of extracting magnesite from the different properties in the neighborhood of Porterville and placing the product on the cars on the railroad is about \$6 to \$7 per ton.

The Tulare Mining Company has been for some years the only large producer on the Pacific Coast. Almost the entire output of their mines

near Porterville was used by the Crown Willamette Paper Co., but during the past year a large tonnage has been shipped to the Eastern Refractories Companies. Aside from the output of the mines of this company, the production of magnesite for the last few years has been very small. Since the beginning of the war a number of new and old properties have been opened up, the most notable being the reopening of the old Harker property, near Porterville, by the Porterville Magnesite Company of San Francisco. A new property adjoining the Tulare Mining Company in the Success district has been developed by the Lindsay Mining Company of Porterville. On the Stewart Ranch north of Porterville large deposits have been developed by the Magnesite Mining Company of Porterville. East of Lindsay a number of new properties are being developed by leasers, while in the neighborhood of Deer Creek, south of Porterville, Messrs. Langley and Cook, of Los Angeles, have opened up some valuable deposits.

History.

The magnesite deposits 4 miles northeast of Porterville were discovered and first described by W. P. Blake, who passed through this region with the United States expeditions making explorations and surveys for a railroad in 1853. Mining operations were started on the Harker property in 1901 and were continuous until 1909. From 1902 these deposits were operated by W. P. Bartlett for the Willamette Pulp and Paper Co. In 1909 operations were suspended, until 1915, when the property was reopened by the Porterville Magnesite Company; now being one of the largest producers in the district.

An undeveloped deposit on South Fork of Tule River, 9 or 10 miles east of Porterville, was opened up in 1907 by the Tulare Mining Company, of which W. P. Bartlett is superintendent. An extensive amount of ore has been developed and a large tonnage is being calcined and shipped from the property. A number of other mines are being developed in the districts north and east of Porterville.

Geology.

Large magnesite deposits occur on the first range of foothills of the Sierra Nevada Mountains, east and northeast of Porterville. The deposits have a general northwesterly and southeasterly strike, the southern limits being in Sec. 10, T. 23 S., R. 28 E., 5 miles east of Terra Bella, while some small deposits occur as far north as the St. John's River (see map, p. 165, shaded portions represent magnesite deposits, and darker portions represent holdings of the large operating companies).

The most extensive deposits are east of Porterville, Lindsay and Exeter. The magnesite occurs in a schistose serpentine mass which is impregnated with magnesite veins and contains some basalt and diabase intrusions. The country rock is a dull, brown serpentized peridotite.

The rock is sheeted in places and contains great numbers of vertical, thin, parallel veins of magnesite. Crossing the vertical veins at a small angle is a second series of veins, and a third series crosses at right angles. According to Frank L. Hess,³ of the U. S. Geological Survey, the veins are probably due to shearing, which produced cracks. These cracks then formed channels for surface waters and were filled with magnesite derived from the decomposition of the inclosing rock and brought by waters from a distance and precipitated. The veins are generally discontinuous and irregular and of narrow widths. Magnesite deposits in the neighborhood of Porterville and Success have been fully described by Frank L. Hess³ and Hoyt S. Gale,⁴ and we have made free use of the data contained in those publications.

Mines.

Adelaide Magnesite Mine. It is situated $6\frac{1}{2}$ miles east of Lindsay, in Sec. 24, T. 20 S., R. 27 E., on the west slope of a hill. A tunnel 150 feet long has been driven on a vein of magnesite 2 feet wide. The vein strikes E.-W. and dips 40° N. Twenty men are employed. R. D. Cole of Lindsay, owner.

Alcorn and Prindle Lease. The property is situated 8 miles east of Porterville, in Sec. 31, T. 21 S., R. 29 E. A series of narrow, parallel veins have been developed by a number of open cuts. Holdings 160 acres. Recently purchased by the Rex Plaster Company of Los Angeles. Seeley Mudd, president. Philip Wiseman, secretary.

Avery Magnesite Mine. It is located 8 miles east of Porterville, in Sec. 6, T. 22 S., R. 29 E., on ridge SW. of South Fork of Tule River. A series of parallel veins with vertical dips and a number of flat veins have been developed on this property.

Developments: Tunnel No. 1 driven 75 feet on vein, striking N. 60° W., dipping 35° NE. Width 18" to 2'. Above tunnel No. 1 there is a tunnel 100 feet long, on east and west vein, dipping south 25° , and having a width of 12" to 2'. Also driving a crosscut tunnel to intersect veins developed on a higher level. Four men are employed. Under lease to G. D. Avery and W. W. Gallagher, of Porterville.

Bartlett Magnesite Lease. On or near the top of a serpentine hill about 1 mile south of schoolhouse at Simmons' Ranch, about 8 miles southeast of Porterville. There are a great number of comparatively thin veins of magnesite. The hill is a portion of the outside range of foothills of serpentinized rock. The country rock is a dull, brown serpentinized peridotite similar to that near Porterville. Some, but not many, of the magnesite veins reach 2 feet in thickness for short distances; generally they are discontinuous and irregular. A small

³U. S. G. S., Bull. 355, pp. 39-49, 1908.

⁴U. S. G. S., Bull. 540, pp. 509-511, 1914.

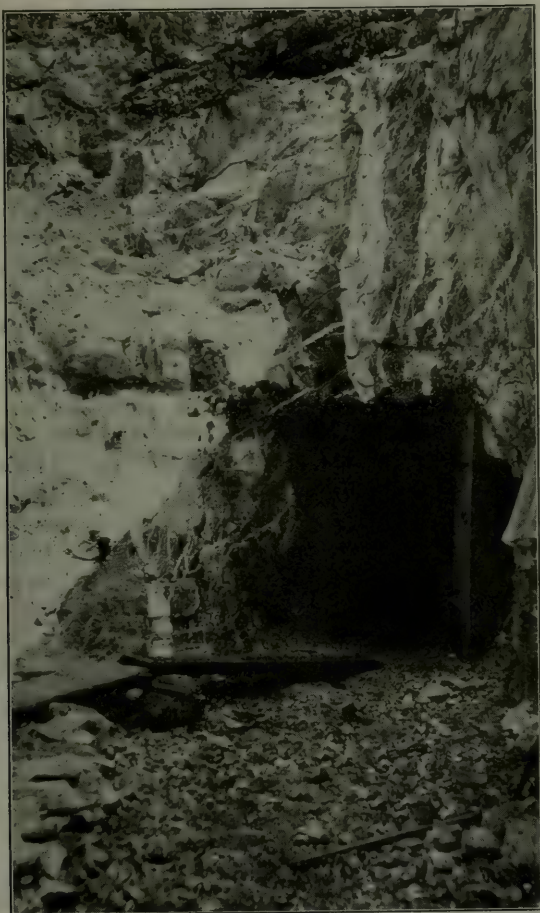
amount of magnesite of excellent quality has been mined on the west side of the hill from a nearly vertical vein running parallel to the course of the hill and ranging from 10" to 18" in thickness. On the east side, near the top of hill, other small deposits of magnesite occur. The veins are being developed by shallow open cuts and short tunnels. Twelve men employed. Owned by G. W. Simmons, of Deer Creek. Under lease to W. P. Bartlett, of Porterville.



Open cut. Blue Crystal Mine, near Lindsay.

Blue Crystal Magnesite Mine. Situated $6\frac{1}{2}$ miles east of Lindsay, in Sec. 24, T. 20 S., R. 27 E. Four claims have been located on the western slope of a hill, on the east side of the mouth of Round Valley. A number of magnesite veins ranging up to 2 feet in thickness crop out on the southwestern face of the hill. The country rock is serpentine, similar in appearance to that of Porterville. The three parallel veins strike NW.-SE. and have steep dips. They are about fifty feet apart. The veins are strong and continuous, with widths ranging from 2' to 3'. The quality of the magnesite is very good. The ore is extracted by means of open cuts and shallow tunnels, there being an open cut and

tunnel on the three main veins. Twenty men are employed. Philip Weisman, H. A. Sundin, of Lindsay, owners.



Burr Bros. Magnesite Mine, near Lindsay. Showing an exposure of vertical magnesite veins.

Bolam and Pinger Lease. Situated on Putnam and Gill ranches to the north of the Harker property, in Sec. 18, T. 21 S., R. 28 E., 4 miles northeast of Porterville. A series of parallel magnesite veins having a course of N. 50° W. and dipping 50° SE., with widths varying from 12" to 2', occur in a schistose serpentine mass. These veins have been developed by tunnels and open cuts. Ten men employed. Under lease to Robert S. Bolam and Leo Pinger, of Porterville.

Burr Bros. Magnesite Mine. Located 3 miles north of Lindsay, on Mrs. Florence Cross' ranch, in Sec. 19, T. 19 S., R. 27 E. On a low hill at the edge of the valley occur a large number of magnesite veins which are more or less parallel, with a general NE.-SW. strike, in a brown serpentinized peridotite. The veins are narrow and irregular, with steep dips, but do not show any continuity. A number of tunnels have been driven on the veins from 50' to 100' in length; also ore is being extracted along the outcrops in a number of open cuts. There are 26 men employed.

California Magnesite Company Lease (Camp 4). Situated in range of foothills 5 miles east of Strathmore, at an elevation of 1180 feet, on Lee Gill ranch. A number of veins of magnesite occur in a schistose serpentine. One series of veins strikes N. 35° E., another system has a course of N.-S., while a third system courses N. 30° W. At an elevation of 1,180 feet on the south slope of ridge a number of open cuts and short tunnels have been driven on a N. 35° E. vein, which dips 60° E., width of vein being 12 inches.

To the north of these workings, at an elevation of 1280 feet, a tunnel has been driven north on a N.-S. vein which dips 75° E., showing a vein varying from 12" to 2' wide. This vein is stoped to surface, a distance of 40 feet, also drifted on 150 feet. A 12-inch vein running N. 30° W. and dipping NE. intersects the N.-S. vein in the tunnel. There are also a number of narrow magnesite veins on the eastern slope of the hill. Idle. Lee Gill, of Porterville, owner.

California Magnesite Company Lease (Camps 2 and 3). This property is situated on the Lee Gill ranch, $4\frac{1}{2}$ miles northeast of Porterville, in Sec. 18, T. 21 S., R. 28 E. A number of magnesite veins occur in brown serpentinized peridotite, on west slope of range of foothills which lies west of Frazier Valley. There are two general systems of parallel veins; one strikes N. 45° W., the other N. 10° W. On the west slope of hills two crosscut tunnels have been driven east, cutting N. 10° W. vein which dips 50° W. The veins have a width of 12" to 2'. Idle. Lee Gill, of Porterville, owner.

Chamberlain Magnesite Deposits. These deposits are on the Chamberlain ranch, 8 miles southeast of Porterville, in Secs. 3 and 10, T. 23 S., R. 28 E. On west slope of a hill which runs in NW.-SE direction, there are numerous outcrops of narrow and irregular veins, with varying width of from 6" to 12". During 1916 the property was under lease to California Magnesite Company. Idle. Selah Chamberlain, of San Francisco, owner.

Davis Magnesite Lease. The property is on the P. J. Montgomery ranch, $6\frac{1}{2}$ miles east of Lindsay, in Sec. 24, T. 20 S., R. 27 E., and is due west of the Blue Crystal mine at a lower elevation. A series of

parallel veins having general NW.-SE. strike occur in a schistose serpentine. The veins have a width of 18" to 2' and are continuous, showing great permanence and continuity. At an elevation of 1000 feet a tunnel has been driven 100 feet southeast on a N. 25° W. vein which dips 75° W. and has an average width of 18". On a parallel vein, at an elevation of 900 feet there is another tunnel 150 feet long, developing a vein having an average width of 2'. Besides these workings there are a number of open cuts on the property. Twenty men are employed. P. T. Davis, of Lindsay, lessee.

Deer Creek Magnesite Mine. It is situated 8 miles southeast of Porterville, on the Carroll ranch, in Sec. 21, T. 22 S., R. 28 E. On the north slope of a hill which lies south of Deer Creek, there are a great number of comparatively thin veins of magnesite, cutting a dull brown serpentized peridotite. The rock is sheeted in places and contains great numbers of more or less perpendicular parallel veins of magnesite. These veins range in widths from 10 inches to 2 feet. They are generally discontinuous and irregular. The veins are being mined by a number of open cuts and tunnels on both the east and west slopes of the hill. Tunnel No. 1 on west slope of hill is 200 feet long, driven on a N. and S. vein having a width of 18" to 2'. On the east slope of the hill there is an open cut and tunnel 200 feet long, on a N. and S. vein; the vein is vertical, width 18" to 2'. In south end of tunnel vein splits into three narrow veins striking N. 10° E., N. 20° E. and N. and S. Near mouth of tunnel a shaft is being sunk on the vein. Under lease to J. W. Langley and H. E. Cook, of Los Angeles. Chas. Carroll, of Deer Creek, owner.

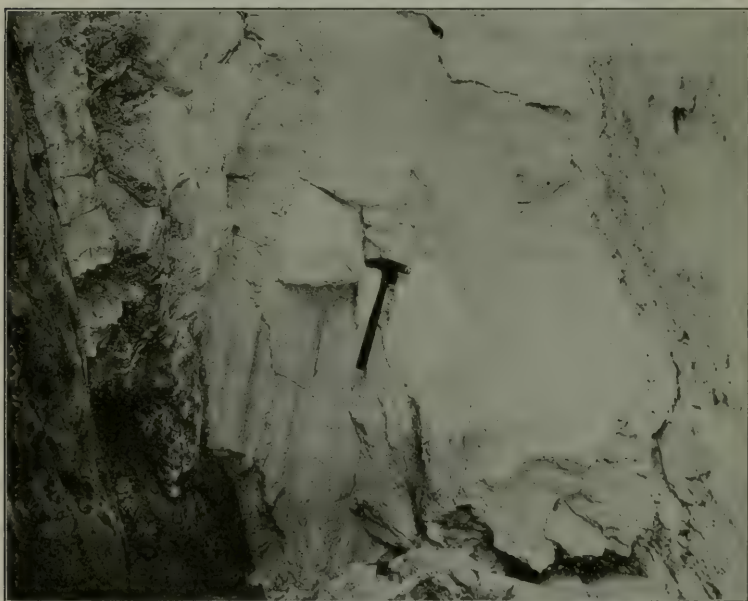
Bibl.: U. S. G. S., Bull. 355, pp. 39, 40.

Dumont Magnesite Mine. This property is situated on land owned by R. J. Dumont, in Sec. 10, T. 19 S., R. 29 E., about 5 miles east of Exeter. Near the top of a large hill in the foothills east of Exeter, a series of NE.-SW. veins of magnesite occur in a brown serpentized peridotite. These veins are more or less parallel and have steep dips, with widths of 8" to 12". The magnesite is mined by means of open cuts and tunnels, there being 6 open cuts and tunnels on the west slope of hill. The ore is hauled with wagons to siding on Visalia Electric Railroad, five miles north of mine. Six men are employed. Under lease to Philip Weisman, of Lindsay.

Duncan Magnesite Mines. On ridge southeast of South Fork of Tule River, on the Duncan Ranch, in Secs. 25, 30, T. 21 S., R. 28 and 29 E., 6 miles east of Porterville, there are extensive outcrops of magnesite veins, on which some development was done by the California Magnesite Company. Idle. Claude Duncan and Mrs. Matilda Duncan, of Success, owners.

Fairview Magnesite Mines. It is situated in foothills, 5 miles east of Lindsay, in Sec. 30, T. 20 S., R. 28 E. Three mining claims have been taken up, namely: Fairview, Fairview No. 1 and Last Chance. On the west slope of hill at an elevation of 950 feet, a crosscut is being driven into hill to cut an east and west vein with a dip to the north. The vein varies in width from 12" to 18". On the east slope of hill a number of veins of magnesite outcrop, which are being developed by tunnels and open cuts. There are 4 men employed. R. R. Gilbert and W. F. Finley, of Strathmore, owners.

Hamilton Magnesite Mine. It is on a small hill running east and west in Yokohl Valley, on the J. C. Hamilton ranch, in Sec. 22, T. 18 S.,



Magnesite vein 3 feet thick. No. 3 workings of Lindsay Mining Company near Success, Porterville district. Photo by Walter W. Bradley.

R. 27 E. A crosscut tunnel is being driven north on the south slope of hill, to cut series of N. 20° W. veins of magnesite that outcrop strongly on top of hill. The brown serpentinized peridotite is about 150 feet wide, with a general N. 20° W. strike and is intersected by a network of small veins 6" to 12" wide. There are 320 acres of patented agricultural land under lease to J. S. Johnson and Frank Carson, of Visalia.

Hawley Pulp and Paper Company's Mine. This company owns 40 acres of land in Sec. 36, T. 21 S., R. 28 E., on a hill east of the South

Fork of the Tule River, 6 miles east of Porterville. The property adjoins the Tulare Mining Company's property on the west. Five to six veins of magnesite have been developed which vary in width from 12" to 8'. There are two systems of veins; one strikes N. 50° W., the other crossing E.-W., dipping at angles of 50° to 60° N.

Developments: No. 1 tunnel, or lower tunnel, is on the west slope of hill and is driven SE. on a 4-foot vein of magnesite which strikes N. 50° W. and dips 45° NE. The middle tunnel is 50 feet above No. 1

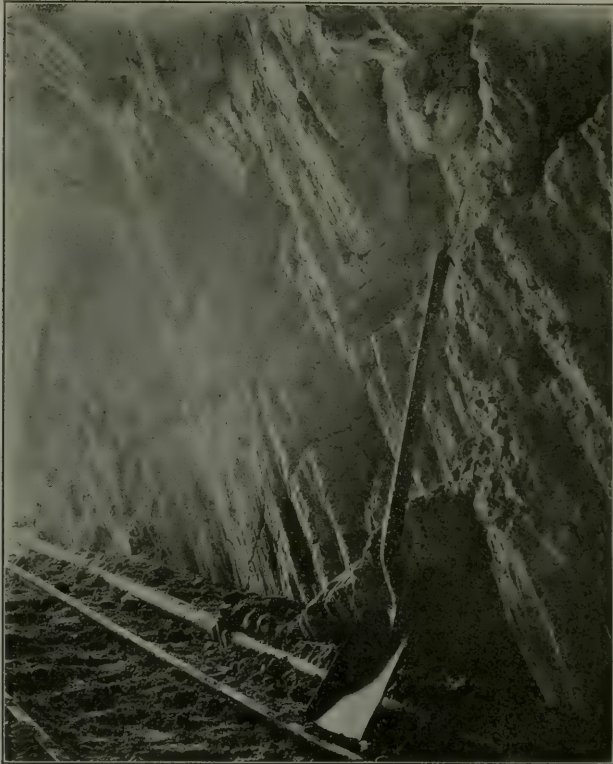


Magnesite mines of the Lindsay Mining Co., near Success, Tulare County, showing tramways and ore chutes.

tunnel and runs in a southwesterly direction on same vein, a distance of 50 feet. In the face the vein shows a width of 18 inches. The upper tunnel developed a parallel vein which has a width of 3 feet. Near the Tulare Mining Company's line a crosscut tunnel runs southwest into the hill, a distance of 225 feet, cutting the Tulare vein, which has a width of 20 feet, with an east and west strike, having an average dip of 60° N. A number of blanket veins were also cut in this tunnel. The ore is being shipped to the Pacific Carbonic Gas Company, of Berkeley, Cal. Ten men are employed. Hawley Pulp and Paper Company; president, W. P. Hawley; secretary, T. Osmond; home office, Oregon City, Ore.

Lindsay Magnesite Mine. It is situated just north of the Tulare Mining Company's mine, in Sec. 31, T. 21 S., R. 29 E., 8 miles east of Porterville. On a high hill on the southwest side of the South Fork of Tule River are a large number of magnesite veins with outcrops ranging in thickness from 12" to 4'. The portions of the hill containing the magnesite are composed of a rock much more completely serpentinized than that nearer Porterville. On the southeast slope and the top of the hill, at an altitude of 1000 feet above the river, are a number of veins ranging up to 6' in thickness. There are also hundreds of irregular

veins, which measure up to 12 inches or more in thickness and which in places form stockworks. The belt of serpentine carrying the magnesite has been crushed and sheeted in a northwesterly direction. There



Slickensided magnesite, showing movement along the vein, in tunnel of the Lindsay Mining Co., near Success, Porterville district. Photo by Walter W. Bradley.

appear to be three main systems of veins which strike N. 35° W., N. 10° W., and N. 20° W., with vertical and steep dips. The vertical veins appear to be more regular and continuous.

At an elevation of 1,100 feet, a tunnel has been driven 300 feet on vein striking NW.-SE. with a vertical dip. This vein varies in width from 12" to 2'. At an elevation of 1200 feet, No. 2 tunnel runs on a vein 12" wide, a distance of 200'. In No. 3 tunnel, 1300 feet elevation, a N. 20° W. vein which has a slight dip to east, has been drifted on a distance of 200'. At a point 150' from the mouth of tunnel there is a split in the vein striking N. 35° E. The vein so far developed has an

average width of 2'. No. 4 tunnel, elevation 1480 feet, is 100' long, developing a 4' vein which strikes N. 10° W. and dips 80° E. This vein lies 400' west of No. 3 vein. Near the crest of the hill, at an elevation of 1500 feet, there is an open quarry on a stockwork of veins, the magnesite being blasted and hand picked at small expense.

By a system of tramways from the different workings the ore is trammed around the northeast slope of the hill, being dropped in chutes



Magnesite mines of the Porterville Magnesite Company, 4 miles north of Porterville, showing location of kiln and loading chute.

from one elevation to another until it finally reaches the loading bins on the railroad. (See photo.) Holdings consist of 170 acres. Twenty men are employed. Lindsay Mining Company, Porterville, owners. R. D. Adams, president and general manager; Arthur Delarey, secretary and superintendent.

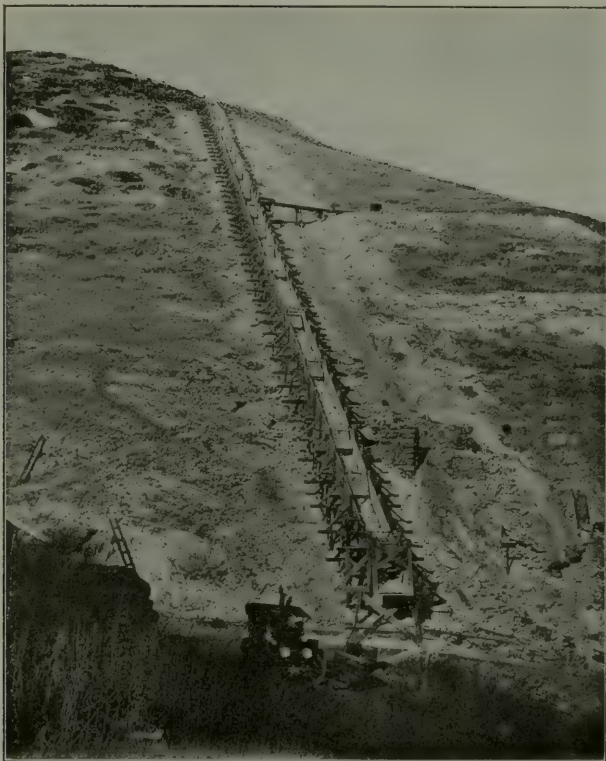
Bibl.: U. S. G. S. Bull. 540, pp. 510, 511.

Merryman Magnesite Mines. They are situated on the southwest spur of Rocky Hill, 2 miles east of Exeter, in Secs. 7, 12 and 31, T. 19 S., R. 26 and 27 E. On the hill there are a number of small veins of magnesite about 500 feet above the valley. These veins occur in the serpentine just west of the granite contact and have a general northerly and southerly strike. A tunnel has been driven on a vein striking N. 60° E., and dipping 40° SE. The vein varies in width from 12" to 2'. About 200' NW. of the tunnel there is an open cut on a stockwork of narrow veins. On the hill to the south a number of narrow veins are being worked by a series of open cuts and tunnels. Merryman Fruit and Land Company, Exeter, Cal., owners. Under lease to H. M. Hathaway, Porterville.

Bibl.: U. S. G. S. Bull. 355, p. 49.

Porterville Magnesite Mine (Harker Mine). It is situated in the outer range of foothills, about 4 miles northeast of Porterville, in Sec. 17, T. 21 S., R. 28 E. The magnesite veins stand out prominently on two rounded hills. One of the hills, which will be referred to as the northern

hill, runs a little east of north, and the other, which will be referred to as the eastern hill, about N. 60° E. At their junction is a saddle about 300 feet below the summits. The veins occur in a brown ser-



Loading chute of the Porterville Magnesite Company, showing system of bumpers.
Photo by Walter W. Bradley.

pentinized peridotite having an apparent bedded structure. The serpentine forms part of a metamorphic complex consisting of a small amount of fine-grained quartzite, amphibolite schist, serpentine and other magnesian rocks, some of which are talcose and mica bearing. The rocks have a generally northerly strike, with a rather high (60°) easterly dip. They are cut off by a granitic mass on the south, a few hundred feet from the deposits. Several granitic dikes cut the serpentine and other rocks, but do not cut the magnesite veins, though basic dikes (amphibolites) of several varieties cut both country rock and the veins. The veins are here and there squeezed to a schist. Faulting is common but does not divide the serpentine into the small irregular

blocks which result in the serpentines of the Coast Range and many others, from the swelling of the rock as it changes its chemical and mineralogical form. However, movement is evident and the magnesite is invariably crushed in the larger veins.

To the east of the hill there is a tunnel 150 feet into the hill at an elevation of 1450 feet. In this tunnel a vein 8 feet wide of tufa-like magnesite was encountered. In this material there has been reformed



View showing outcrop of horizontal veins on Porterville Magnesite Company's property, near Porterville.

normal magnesite, which has been worked. These reformed veins follow no well-defined system. They occur at such points where the conditions were favorable. The tunnel is located near a granite intrusion on the eastern portion of the property, and therefore the veins probably lack continuity.

Magnesite veins on the western area of the property: On the south of the western hill, a main gash vein has been explored by a series of tunnels at different elevations, the main or lower tunnel being about 800 feet long. This vein ranges in thickness from 2' to 8', and strikes N. 45° W., dipping 65° to 70° NE. An amphibolite dike 2' to 3' thick has been intruded in the serpentine near the vein and follows it a short distance. About 100 feet from the southeast outcrop of the vein it is joined by another vein of about the same thickness, which has a strike of N. 10° W. These veins have been open-cut and stoped extensively. An interesting characteristic of the magnesite veins is noticed on this side of the hill, and that is that they are thicker underground than at the outcrop, and they widen out to an extent not to be anticipated by the thickness of the croppings; also that intersecting veins occur

underground whose presence is not at all indicated by any surface croppings. These interesting veins are usually smaller than the main veins, occur at smaller intervals and in some cases occur so frequently as to form a stockwork of veins.

The veins in this area are tilted at quite a steep angle—about 70° . Tunnels have been driven at an elevation of 1510' and 1600', with an



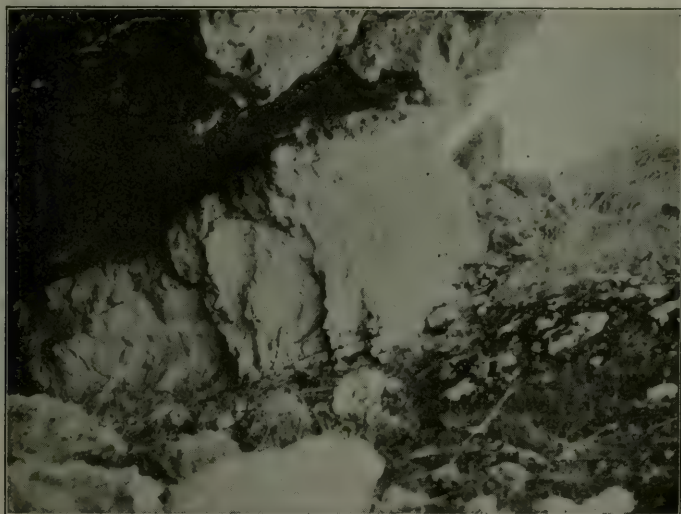
On the south of the Western Hill, of the Porterville Magnesite Company's property, showing main gash vein striking N. 45° W., dip 70° NE., width 2' to 8'.

open-cut to left of tunnel. At the top of hill on the western slope there is a large area of croppings of magnesite veins, on which some development is being made.

To the north, on top of the hill, the principal veins take on a more or less horizontal bed and the exposures are quite easily traced on the surface. In this area above elevations of 1550 feet on the north end of the hill, three distinct veins dipping about 12° S. are found, while between elevations of 1550' and 1500' there is a very prominent vein parallel to the others. Intersecting veins more or less vertical are indicated over this entire area and are also intersected by present workings. The workings on the blanket veins consist of a series of tunnels and the magnesite is mined in similar manner to flat coal seams. The waste broken from stripping the vein is used to support the roof. A

main haulage way is used with different laterals run off at convenient intervals. These tunnels are driven through the hill on the horizontal veins.

To the north of this area on the north slope of hill and at a lower level there are innumerable outcrops of magnesite which are being developed by means of tunnels and open cuts. Some of these veins are from 2' to 4' thick. The blanket veins are from $1\frac{1}{2}'$ to 3' thick, and



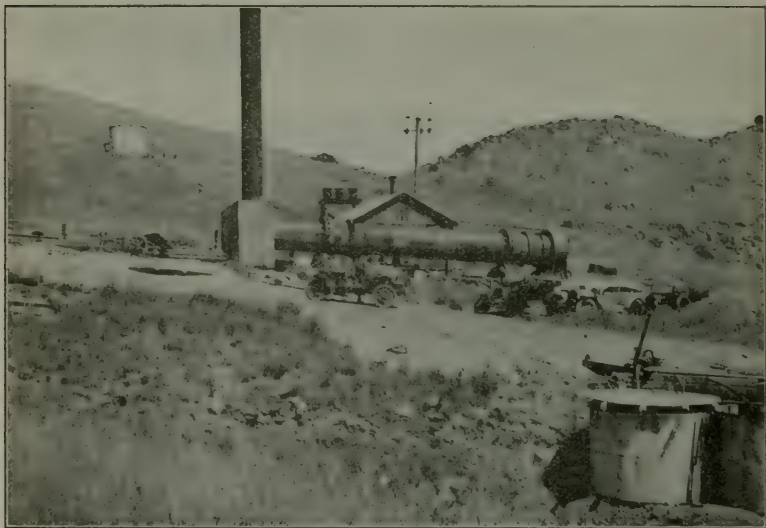
Magnesite vein dipping 12° S., 4' wide, near top of hill on north end of the Porterville Magnesite Company's property, near Porterville.

the magnesite from them is of very fine quality. On the north slope of the hill, at an elevation of 1050 feet, a tunnel has been driven S. 40° E., 400' on a vein from 2' to 4' wide. Vein dips 50° SW. This vein is being stoped from tunnel level to surface. The walls show a very strong movement with a drag to the southeast. Besides this vein there are a large number of strong croppings, which have a general northerly and southerly strike, with steep dips to the west. There is a rotary kiln 50' long by 50" in diameter on the property not yet in use. The ore is trammed from the different workings to an inclined loading chute, 433 ft. long leading to the loading bins, where the motor trucks take the product for haulage to Porterville.

There are 50 men employed. Porterville Magnesite Company, 391 Monadnock Bldg., San Francisco, Cal., owner; W. W. Kamm, president; P. S. Kamm, secretary; F. F. Parker, superintendent.

Bibl.: Bull 38, pp. 333-334. U. S. G. S. Bull. 355, pp. 40-46.

Stewart Magnesite Mine. Situated on low hill, 6 miles northeast of Porterville, in Sec. 12, T. 21 S., R. 28 E. On the east and west slopes of the hill there are two systems of veins, viz: one series of parallel



Rotary calcining kiln of the Porterville Magnesite Company, 4 miles north of Porterville.

veins striking N.-S. and dipping 60° W.; the other is a system of veins striking E.-W. The former are continuous and strong, with widths ranging from 2' to 4', while the latter are narrow and irregular.

The north and south veins have been developed by a number of tunnels from 100' to 200' in length. A large tonnage is being shipped from the property. Forty men are employed. George W. Stewart, of Porterville, owner. Under lease to the Magnesite Company of Porterville; Robert Smith, president; H. A. Doyle, secretary and manager.

Headberg Magnesite Deposit. It is $4\frac{1}{2}$ miles east of Lindsay, in Sec. 11, T. 20 S., R. 27 E., in foothills east of Round Valley. By means of an open quarry a stockwork of magnesite veins has been mined. Idle. John Headberg, of Lindsay, owner.

Tulare Mining Company. The magnesite veins of the Tulare Mining Company are situated on the north face of a high hill southwest of South Fork of Tule River, in Secs. 30 and 31, T. 21 S., R. 29 E., 10 miles east of Porterville. The portions of the hill containing the magnesite are composed of a rock very highly serpentinized. At the foot of the hill, along the edge of the narrow flood plain of the river, a magnesite vein running NW.-SE. and dipping 60° NE. has been extensively worked. The outcrop is from 3' to 10' thick and is exposed

prominently for a distance of about 500 feet. In places the vein contains horses of serpentine. The main tunnel has been driven 1400 feet along the footwall of this vein with crosscuts driven at regular intervals to the hanging wall. (See map.)

These workings have developed a mineralized vein from 10' to 20' in thickness, probably 40% of which is magnesite. A series of stopes have been run from the tunnel to surface. In stope A, about 400' south of



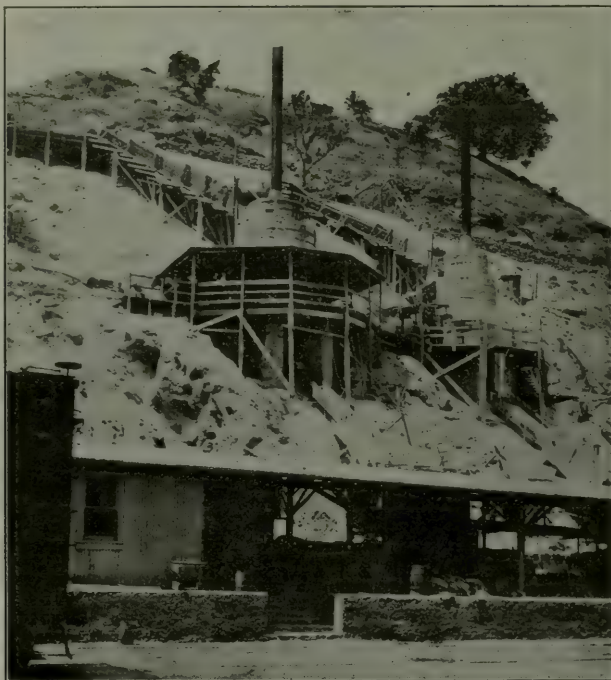
Magnesite mines of the Tulare Mining Company, near Success, Porterville district.
Photo by Walter W. Bradley.

portal, 15' of ore has been developed, showing stringers and veins of magnesite mixed with serpentine. About 200' north a parallel vein has been developed, striking N. 45° W. and dipping 45° SE., with 12' to 20' of ore.

A crosscut tunnel 300 feet long has been driven near the western boundary line of the company's property, intersecting the main tunnel level. This crosscut tunnel cut a vein about 10' wide, 110' from the portal. The crosscuts have developed some large bodies of magnesite, and in places these bodies are mixed with the country rock or foreign matter that probably reduce the quality. The present developments have opened up a large reserve of ore. The method used in stoping this ore is by means of breaking down the magnesite from the roof of the far end of workings, allowing the waste to accumulate, so that the face of magnesite, which constantly retreats towards portal of stope, could be reached from the debris slope down which the magnesite was rolled and removed in cars from the foot of pile of debris.

South of the main tunnel a stockworks of magnesite veins is being mined in an open quarry, the magnesite being easily sorted out and trammed to kilns at small expense. On top of the hill, at an altitude of 1000 feet above the river, are a number of veins ranging up to 6 feet

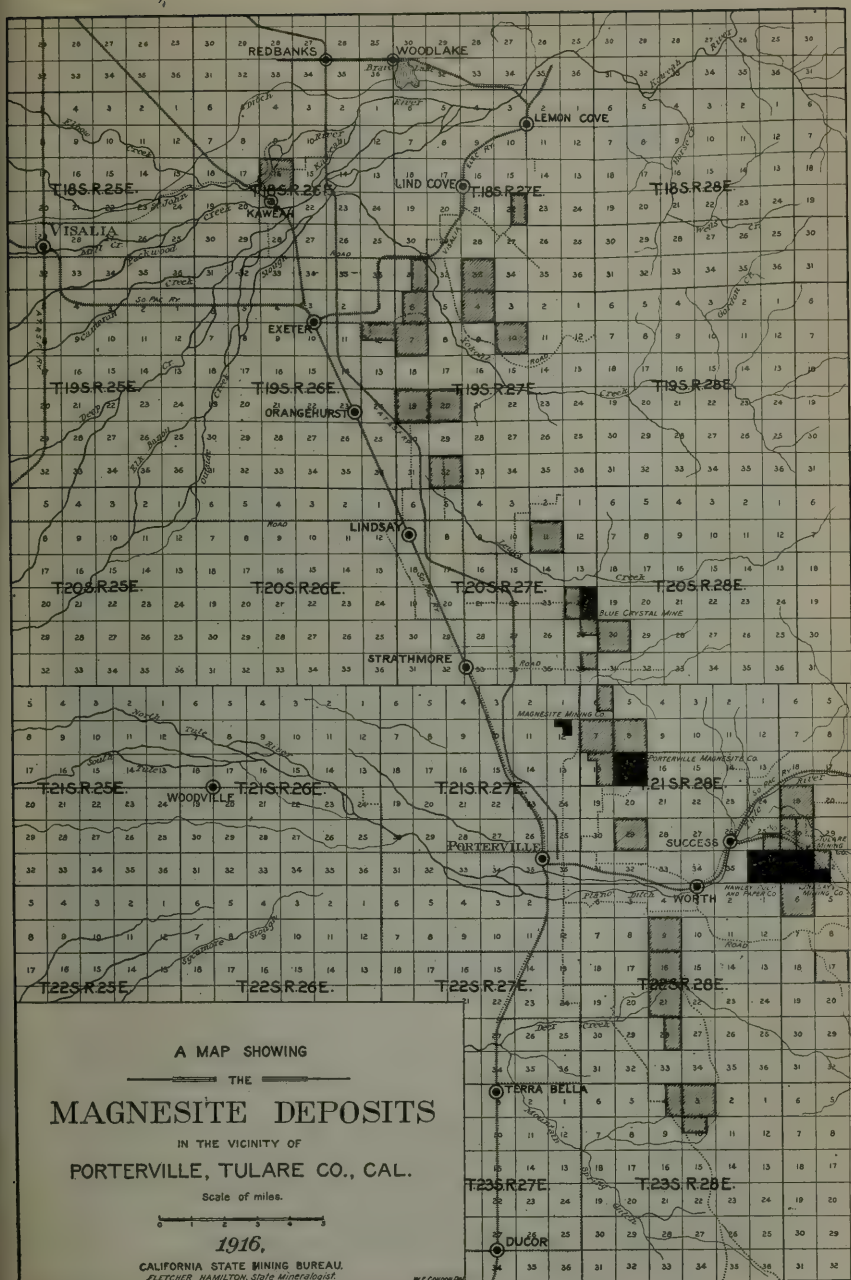
in thickness. These veins are nearly a mile south of the main vein, and in the intervening space there are hundreds of irregular veins, which in places forms stockworks that could be blasted and hand-picked

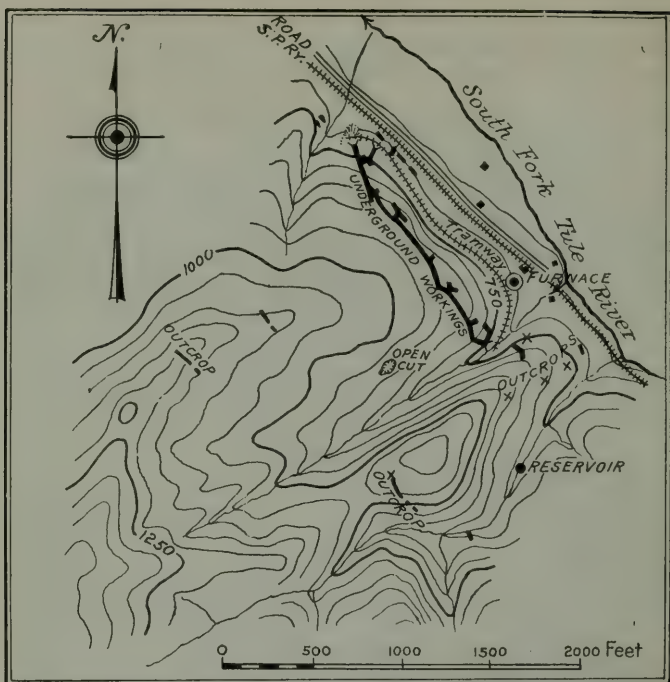


Magnesite calcining kilns of the Tulare Mining Company, near Success, Porterville district. Photo by Walter W. Bradley.

at small expense. The belt of serpentine carrying the magnesite has been crushed and sheeted in a northwesterly direction, and probably owes this structure to the forces that acted similarly on the magnesite-bearing serpentines nearer Porterville, which lies about 6 miles northwest.

The magnesite is trammed from the different workings, and the material over 4-inch size is broken by hand to 4-inch and finer, then calcined in two vertical kilns, which have a capacity of 40 tons per kiln, producing a calcined product of 36 tons. Some crude rock from the north end of the property is being shipped to the General Refractories Company. A small proportion of the calcined product is re-ground and shipped to different chemical companies. The remaining calcined product is shipped to the Willamette Pulp and Paper Company for the digestion and whitening of wood-pulp for paper. Fifty men





Sketch map of magnesite deposits of Tulare Mining Company, near Success, showing underground workings and principal outcrops of veins. From U. S. G. S. Bulletin 540.

are employed. Tulare Mining Company, 722 Montgomery St., San Francisco, Cal., owner; F. G. Wight, president; Chas. M. Whitney, secretary; W. P. Bartlett, superintendent.

Bibl.: U. S. G. S. Bull. 355, pp. 46-48; Bull. 540, pp. 510, 511.

Wood Magnesite Mine. It is situated 3 miles east of Exeter, in Sec. 6, T. 19 S., R. 27 E., on south slope of Badger Hill. There are a few small veins of magnesite on the southeast slope of the hill. The largest vein is not more than 12" wide, and most of them are only 3" to 6" wide. The area over which the veins occur is very small, and in this area the veins are being developed by a number of shallow open cuts. Six men are employed. J. L. Hamilton, of Yokohl Valley, owner. Under lease to F. G. Hyde and L. L. Wood, of Lindsay.

MANGANESE.

Barbour Manganese Deposit. It is situated one mile west of Milo, in Sec. 33, T. 19 S., R. 29 E., about 8 miles north of Springville, the terminus of the Porterville and Northeastern Railroad. A deposit of pyrolusite 18 inches wide occurs with a vein of quartz in a granitic

formation. A prospect shaft has been sunk to a depth of 10 feet. Idle. Frank Barbour, of Stockton, owner.

Cole Manganese Mine. Located 2 miles northeast of Lindsay, in Sec. 32, T. 19 S., R. 27 E., on small hill east of the valley.

A lens of jasper occurs in iron-stained shale which runs N.-S. and dips 75° W. The outcrop is 25 feet wide. A shaft has been sunk on the outcrop to depth of 30 feet, developing some low grade manganese ore running high in silica and iron. Idle. R. D. Cole, of Lindsay, owner.

MINERAL SPRINGS.

Throughout Tulare County in the Sierra Nevada are a large number of hot, warm and carbonated springs. The following enumerated springs have been described in "Water Supply Paper" 338, on "Springs of California," by Gerald A. Waring of the United States Geological Survey.



No. 1 Spring at California Hot Springs, 30 miles southeast of Porterville, Tulare County.

California Hot Springs. The springs are located 30 miles southeast of Porterville, on the west bank of Deer Creek, at an elevation of 3200 feet above sea level. The nearest railroad point is at Duor, on the Southern Pacific Railroad, a distance of 22 miles.

Four springs issue at points 5 to 20 yards apart along the southern bank of Deer Creek Cañon, 20' to 30' above the stream-bed. This group yields about 35 gallons a minute of water of 120° to 126° in temperature. Half a mile upstream on the northern side of the creek

another group of one main and two minor springs discharge about one-half as much water at a temperature of 105°. All springs are noticeably sulphuretted, but they are not highly mineralized. Water from the upper springs is piped to a tank and thence to baths and grounds for a cool water supply, while pipes from the lower group conduct hot water about 300 yards to baths near the hotel. The springs from the lower group are also used for drinking and are



View of hotel at California Hot Springs, Tulare County.

easily reached by a footbridge and path along the cañon side. The springs issue from seams in coarse-textured gray granite, which is the country rock of the region. The water is of the sulpho-saline-alkaline variety, highly mineralized. There is a commodious hotel, together with its large annexes and tent rooms, capable of accommodating a large number of guests. Aside from hotel accommodations there are a number of furnished and partly furnished cottages with baths. There is a large bathhouse conveniently located near the hotel. California Hot Springs Company, owners. Mrs. J. H. Williams, president. L. S. Wingrove, secretary and general manager.

The following analysis was made by Curtis and Thompson of San Francisco, March 29, 1911:

Mineral Spring Water (Temp. 124° F.) No. 2, or House Spring.

"The analysis expressed in ions to hypothetically combine as follows :

	Parts per million	Grains per gallon
Ammonium chlorid (NH_4Cl).....	0.015	0.001
Lithium chlorid (LiCl).....	2.133	0.124
Potassium chlorid (KCl).....	1.760	0.103
Sodium chlorid (NaCl).....	39.325	2.305
Sodium nitrate (NaNO_3).....	0.425	0.025
Sodium meta-borate (NaBO_2).....	5.600	0.326
Di-sodium arsenate (Na_2HAsO_4).....	2.280	0.133
Sodium sulphate (Na_2SO_4).....	8.140	0.475
Sodium carbonate (Na_2CO_3).....	61.500	3.585
Sodium bi-carbonate (NaHCO_3).....	44.361	2.585
Magnesium bi-carbonate ($\text{Mg}[\text{HCO}_3]_2$).....	1.138	0.066
Calcium bi-carbonate ($\text{Ca}[\text{HCO}_3]_2$).....	6.910	3.403
Ferrous bi-carbonate ($\text{Fe}[\text{HCO}_3]_2$).....	2.451	0.143
Silica (SiO_2)	53.800	3.135
Totals	230.038	13.409

"The water also contains traces of Potassium bromid (KBr), Potassium iodid (KI) and Calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$."

Sanitary analysis:

Total solids	210.344
Free ammonia (NH_3).....	0.005
Albuminoid ammonia (NH_3).....	0.034
Nitrogen (N) in nitrates.....	0.074
Oxygen consumed	0.150

Coburn Soda Springs. It is situated at Springville, on the north bank of the North Fork of Tule River, at an elevation of 1000 feet. The spring rises from a fissure in the granite, which has been walled up in a cement basin. The water has a temperature of 68°F . Much gas continually rises with the water, which is moderately carbonated, and stains its run-off channel with iron. The following analysis shows that the water is of a rather strongly mineralized, secondary alkaline and primary saline character:

Analyst and authority, C. H. Stone (1906).

Constituents are in parts per million.

Constituents	By weight	Reacting values
Sodium (Na)	539	23.43
Potassium (K)	19	.49
Calcium (Ca)	179	8.94
Magnesium (Mg)	52	4.25
Iron (Fe)	13	.48
Aluminum (Al)		
Sulphate (SO_4)	21	.45
Chloride (Cl)	618	17.45
Carbonate (CO_3)	618	20.60
Silica (SiO_2)	76	2.50
Carbon dioxide	2,135 Present	Present

The spring is the best known soda spring in this region. A. M. Coburn, of Springville, owner.

Doyle Soda Springs. They are situated 13 miles east of Springville, on flat on the west side of North Fork of the Middle Fork of Tule River. Two springs of moderately carbonated water issue from pools about 3 feet across, near the western bank of the river, within 15 yards of the stream. A third spring issues from a crevice in granitic-gneiss nearer the river. The waters are strongly carbonated and there is considerable iron stain near the spring vents. A small amount of carbonate of lime or magnesia is also deposited by the spray from the main springs, but the water is probably not highly mineralized. All the carbonated water probably issues from the gneiss, which seems to form a belt in the granitic rock. The springs are used as a camping resort. San Joaquin Light and Power Company, owner.

Little Yosemite Soda Spring. It is 65 miles north of Kernville, Kern County, in the Kern National Forest. The spring is about $2\frac{1}{2}$ miles north of a small lake known as Kern Lake and 100 yards west of the river. The water rises in a rock-walled pool 3 feet below the normal ground surface, at the base of the bank in the meadow soil. The water is cool (51°), strongly carbonated, and deposits considerable iron. The following analysis shows that the water contains only a moderate amount of solids in solution, being essentially primary and secondary alkaline in character.

Analyst, Oscar Coew (1876).

Constituents are in parts per million.

Constituents	By weight	Reacting values
Sodium (Na) -----	109	4.76
Calcium (Ca) -----	64	3.20
Iron (Fe) -----	4.5	.16
Chloride (Cl) -----	28	.80
Carbonate (CO_3) -----	220	7.32
Silica (SiO_2) -----	73	2.42
	498.5	
Carbon dioxide (CO_2) in excess.		

Lloyd Meadows Springs. Situated in Lloyd Meadows, on the banks of Freeman's Creek, about 42 miles northeast of Porterville and about 9 miles east of Nelson's Camp by trail. A cool, carbonated spring, used by campers as a drinking spring. The yield of water is not large. The spring is within the boundaries of the Sequoia National Forest.

Soda Spring on Middle Fork of Tule River. A small carbonated spring is situated 6 miles east of Springville, on the northern side of the Middle Fork of Tule River, and about $1\frac{1}{2}$ miles below the junction of two main branches of the Middle Fork, at an elevation of 2400 feet.

Soda Spring in Monache Meadow. It is situated in Monache Meadows, 14 miles southwest of Olancha, at an elevation of 8000 feet. The spring issues near the east base of Monache Mountain, a rhyolite mass that towers above the meadow. The water is warm (100°) and is distinctly sulphuretted as well as carbonated.

Nelson's Soda Springs (Camp Nelson). These springs are 15 miles east of Springville, on north bank of the South Fork of the Middle Fork of Tule River, at an elevation of 4650 feet. Four carbonated springs rise in a region of granitic rock, but on the slopes above them are ledges of limestone that may account for apparent high amount of calcium in their waters. The limestone appears, possibly as included masses in the granitic rock. The lowest spring is on the southern bank of the stream $\frac{1}{4}$ mile southwest from the resort. It issues beneath an overhanging bank, in a small natural grotto of lime carbonate, and flows over an iron-stained terrace of the same material. The water is strongly carbonated. Temperature 69° F. A second spring rises $\frac{1}{3}$ of a mile southeast of the resort, about 50 feet above and 50 yards from the north side of the river. It forms a small rock-walled pool. Water is strongly carbonated. Temperature 63°. About 75 yards east of this spring another carbonated spring issues on the low bank near the river in a deposit of lime carbonate that borders the stream for 200 yards. About $\frac{2}{3}$ of a mile farther east a fourth spring rises in a little meadow. It yields effervescing carbonated water that is fairly cool, temperature being 63°.

The resort is used as a summer camping place, and is reached by trail from the San Joaquin power house, which is at the junction of the north and south forks of the Middle Fork of Tule River. Mrs. C. B. Smith and Carr Wilson, of Springville, owners.

Soda Spring Near Quinn Horse Camp. Quinn Horse Camp is in the southeast end of the Sequoia National Park, about 9 miles in a direct line west of Kern Lake, but 16 miles by trail over Coyote Pass, and is 71 miles northeast of Porterville. Near Soda Creek, which heads near the camp, there is a carbonated spring of considerable flow that is known to travelers over the trails in this region.

Soda Creek Spring. On the Nelson Camp trail there is a carbonated spring on Soda Creek 150 yards above the trail. It is $9\frac{1}{2}$ miles east of Springville. The spring issues from granitic boulders at the eastern side of the creek. The water is strongly carbonated, tastes sweetish and deposits iron, but a noticeable amount of lime carbonate was not seen.

Soda Spring, on South Fork of Middle Fork of Tule River. It is situated in the Sequoia National Forest Reserve, 8 miles east of

Springville. A carbonated spring of unusually large flow rises on the northern side of the South Fork of Middle Fork of Tule River about 2 miles above the junction with the North Fork. The yield of the spring has been estimated at 25 gallons per minute. The water is warm (71°), strongly carbonated and tastes faintly sweetish, probably of iron. A deposit of lime carbonate that is much iron-stained extends to river's edge. The rock near it is granite.

Tule River Soda Spring. The spring is 16 miles east of Porterville, on the Tule Indian Reservation. It is situated about 200 yards southwest of an old schoolhouse, at the north edge of the South Fork of Tule River. The spring issues beneath a large granitic boulder, from crevices in gneiss that is similar to the rock at Doyle Soda Springs. The main spring rises in a rock-walled basin 2 feet square. The water is moderately carbonated and deposits considerable iron.

Soda Spring in upper Funston Meadow. The spring is in Upper Funston Meadow, about 13 miles by trail northward from Kern Lake, between two branches of Kern River, about 69 miles northeast of Porterville, in Sequoia National Forest Reserve. The water is cool, moderately carbonated, and seems to be similar in character to the one near Kern Lake.

STONE INDUSTRY.

Crushed Rock.

Grant Rock and Gravel Company's Quarry. The quarry is situated 8 miles northwest of Visalia on ridge north of St. John's River. A hard serpentinized peridotite is being quarried from an open quarry 350 feet wide by 80 feet high. The method used in breaking rock is to run a series of small parallel adits a distance of 50 feet in face of quarry. Then to drive drifts at right angles to main adit a distance of 30 feet, forming a **T**. The drift is loaded with 6 tons of explosive and hermetically sealed. The charge will bring down an immense amount of material. The broken rock from the face of the quarry is hauled a distance of 275 feet to crushing plant bins, in Kalvaugh New Model underslung carts—capacity 36 cubic feet. From bins the rock is crushed by two Austin No. 5 gyratory crushers, making a $2\frac{1}{4}$ " product. From the crushers the material is elevated to two rotary screens (18' long x 48" diameter) and screened to following sizes: $\frac{3}{8}$ " to $\frac{3}{4}$ ", $1\frac{1}{2}$ " to $2\frac{1}{4}$ ". All material over $2\frac{1}{4}$ " returned to Symonds disc crusher. The screens have a capacity of about 100 tons per hour. The product from Symonds crusher is re-elevated and screened. Four sizes of material are produced, namely:

Screenings.

No. 1 product is $\frac{3}{8}$ " to $\frac{3}{4}$ ".

No. 2 product is $\frac{3}{4}$ " to $1\frac{1}{2}$ ".

No. 3 product is $1\frac{1}{2}$ " to $2\frac{1}{4}$ ".

The capacity of the plant is 1200 tons per day. Thirty men are employed. Grant Rock and Gravel Co., Cory Bldg., Fresno, owner.

Sand.

Kings County Rock Quarry. The Board of Supervisors of Kings County, J. M. McClellan, chairman, Hanford, has recently bought the NE. $\frac{1}{4}$ of NE. $\frac{1}{4}$ of Sec. 18, T. 18 S., R. 26 E., 2 miles northwest of Kaweah, with the intention of establishing a quarry for road metal. There are some outcrops of magnesite on the property, which are being developed by T. D. Hoyle, of Los Angeles, under lease.

Parker Sand Plant. Eight miles northwest of Visalia, near Roche siding on the Southern Pacific Railroad, the Dorsey-Parker Company are extracting sand from the St. Johns River. The sand is extracted



Grant Rock and Gravel Company's quarry, northwest of Visalia.

from the river bottom by means of a drag-line scraper, and from hopper on river bank is conveyed by 12" belt conveyor to railroad cars on the siding. The sand is used for road work and also by glass manufacturers.

ZINC-LEAD.

Mineral King Mining District.

It is situated about the headwaters of the Middle Fork of the Kaweah River, 60 miles northeast of Visalia, and 37 miles northeast of Lemon Cove, the terminus of the Visalia Electric Railroad. Located in T. 17 S., R. 31 E.

The village of Mineral King is in the bottom of a deep cañon, at an elevation of 7830 feet above the sea. All the country around here is chiefly granite. A short distance below the village the wagon road

passes by a heavy deposit of calcareous tufa. The granite varies a great deal in character. Some of it is porphyritic, with large crystals of feldspar, and is frequently traversed by veins of quartz and feldspar. The Mineral King mines are all in a belt of very highly metamorphosed calcareous slates and siliceous limestones which strike N. 30° W. and dip southeast at high angles varying from 60° upwards. The crystalline



View of Mineral King Mining District, looking east.

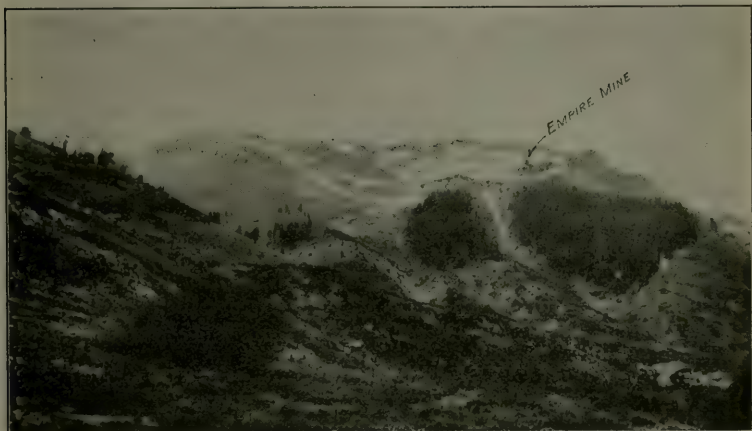
limestone seems to be irregularly distributed through the slates, and there are complex sulphides of copper, lead and zinc associated with arsenopyrite carrying silver values. These ores usually occur on contact of the limestone with slate or granite.

The Mineral King mining district was discovered on August 26, 1873, by J. A. Crabtree, A. Luke and S. Belden, of Porterville. The first discovery of ore was made on the White Chief claim about $2\frac{1}{2}$ miles south of Mineral King. In 1879-1880 during the silver excitement there was a rush to this district. Owing to its inaccessibility and the distance from transportation, also to the complex character of the ores, only spasmodic attempts at mining have been made. The Empire mine was opened up in 1875, a tramway and ten stamp mill operated for a short time, in an attempt to extract the silver values from the ores by amalgamation, but with poor success. The mill and tramway have been carried away by snowslides.

On the McGuinnis, Empire, White Chief, Lady Franklin and Silver Lake claims there are valuable deposits of lead and zinc ores. Some

recent discoveries of zinc have been made on North Alder Creek, 16 miles northeast of Springville.

Chihuahua Mine. It is situated on ridge between Lake and Rock Gorge cañons, 2 miles east of Mineral King in Sec. 13, T. 17 S., R. 31 E., at an elevation of 10,500 ft. A vein 12 inches in width running



View of Mineral King Mining District, looking north.

NW.-SE. and dipping 75° SW. occurs on contact between limestone and slate. A crosscut tunnel 150 feet long has been driven to cut the contact. The quartz carries galena with pyrite. Idle. Arthur Crowley, of Mineral King, owner.

Comanche Mine. It is $1\frac{1}{2}$ miles southeast of Mineral King in Sec. 22, T. 17 S., R. 31 E., on top of ridge between Eagle Lake and Mosquito Lake cañons, at an elevation of 9600 feet. The formation is slate. Vein 12" wide strikes N.-S. and dips 80° W. The ore is zinc sulphide in an epidote gangue. Shaft 50 feet deep. Idle. Arthur Crowley, Mineral King, owner.

Crystal Mine. It is a prospect 2 miles northeast of Mineral King in Lake Cañon, at an elevation of 10,000 feet. Shaft 20 feet deep on 6" to 12" vein, which occurs on contact between slate and limestone. The vein strikes N.-S., and dips 75° W. The ore is a lead-zinc sulphide. Idle. T. J. Crabtree, of Porterville, owner.

Dolly Varden Mine. Situated $1\frac{1}{2}$ miles southeast of Mineral King, on ridge between Eagle Lake and Mosquito Lake cañons, at an elevation of 10,000 feet. A vein of quartz 8" to 12" wide occurs in granite. Strikes N. 60° E., dipping at an angle of 65° NW. An incline shaft has been sunk to a depth of 25 feet. The ore occurs on a fault fracture which has been filled with quartz that is highly mineralized with lead-

zinc sulphides and contains high silver values. Idle. Robert Johnson, J. M. Thompson, Visalia, owners.

Empire Mine. This property is situated 1 mile northeast of Mineral King, on the south slope of Empire Mountain, at an elevation of 10,400 feet. The claims embraced in the property are: Empire, North Empire, and Empire millsite. The ore is sphalerite associated with some galena, and arsenopyrite in a calcite gangue. The ore occurs on the contact of limestone, granite and a metamorphic slate.

At an elevation of 10,000 feet a crosscut tunnel has been driven 600 feet NE. to cut the contact. About 400 feet NE. of this tunnel, at an elevation of 10,400 feet, another tunnel runs 500 feet, N. 25° E., intersecting a shaft at a depth of 125 feet, about 400 feet from portal of tunnel. About 50 ft. above this tunnel, there is a tunnel 50 ft. long on a streak of ore which cuts the limestone. From this tunnel level, the shaft has been sunk to a depth of 125 feet, striking an open cave in the limestone which contained a deposit of lead-silver carbonate. The mineralized limestone from these workings was milled by a former company in 1879 for its gold and silver values. The ore streak in cave has a general N.-S. strike with a dip of 70° W. An epidote dike occurs on the contact with limestone and metamorphic slates. The calcite lens in which the cave occurs is 50 feet wide and dips 50° to the southwest. This lens is overlain by a capping of metamorphic slate.

The siliceous limestone is mineralized with sphalerite, galena and arsenopyrite. To the north of these workings along the epidote dike which cuts the limestone and has a general north and south course, there is a shaft 10 feet deep, sunk on a heavily iron-stained cropping, showing 6 feet of zinc sulphide ore in a calcite gangue. In this section the crystalline limestone seems to be irregularly distributed through the slates and there is no evidence of a well-defined vein on the Empire claim. Most of the gangue is limestone associated with crystalline quartz, which is coated with iron oxide.

The Empire mine was first discovered in 1875, and worked until 1880, when operations were suspended on account of the complex character of the ore. Idle. W. O. Clough, of Mineral King, owner.

Bibl.: Rep. VIII, p. 645.

Empire Extension North Claim. A patented claim and millsite to the northwest of Empire group. There is a short crosscut tunnel and number of shallow shafts on this claim. No ore developed. Idle. Arthur Crowley of Mineral King, owner.

Franklin Fair Mine. It is a prospect situated 1½ miles southeast of Mineral King, at the intersection of Fairwell Gap and Franklin Cañons. Idle. H. D. Sweet, J. E. Barton, Visalia, owners.

Iron Capping Mine. Sixteen miles northeast of Springville, on ridge north of the South Fork of Tule River, at an elevation of 7100

feet, 18 claims have been located on an iron gossan capping 200' to 500' wide. A number of prospect holes have been sunk through the capping from 4' to 6' deep, which have proven an ore zone beneath the capping containing complex sulphide ores of copper, lead and zinc associated with iron sulphides. J. Sub. Johnson, Frank Carson and Geo. McGeorge of Visalia, owners.

Lady Franklin Mine. It is situated $1\frac{1}{2}$ miles southeast of Mineral King, on slope of ridge south of Lady Franklin Cañon, at an elevation of 9800 feet, in Sec. 25, T. 17 S., R. 31 E. Holdings consist of two claims, namely: Lady Franklin and Mohawk, giving 3000 ft. on the lode. It is in a belt of thin bedded limestone intercalated between the slates, about 20' to 40' thick, which strike N. 50° W., and dip at 70° NE. The slates extend $\frac{3}{4}$ of a mile northeast from here to where the granite comes in.

The whole width of this belt of limestones is perhaps 2 miles long. The only productive layer is a stratum 3 feet thick on the footwall of the limestone. The ore is very heavy, containing lead, zinc, and arsenopyrite with traces of copper, also in places shows some antimony sulphide ore. On the southeast end of the Mohawk claim a prospect hole has been sunk to a depth of 10 feet, showing 2 feet of zinc sulphide ore.

About fifty feet southeast of this shaft in the Lady Franklin claim there is a prospect shaft which has opened up 4 feet of zinc sulphide ore in a calcite gangue, also an open cut showing 8 feet of mineralized schist.

At 300 feet southeast of these workings there is a prospect shaft 8 feet in depth which has 2 feet of antimony and zinc sulphide ore, in an epidote gangue. South of this shaft about 200 feet, a tunnel has been driven 50 feet on the contact developing 4 feet of zinc ore. There is about 200 tons of complex sulphide ores on the dumps from these workings. The ore zone is strong and continuous along the contact of the limestone and metamorphic slates, and there is a possibility of developing a large tonnage of ore on these two claims. Idle. T. J. Crabtree of Porterville, owner.

Bibl.: Report VIII, p. 647.

McGinnis Group of Mines. These mines are situated $1\frac{1}{2}$ miles northeast of Mineral King, on ridge north of Monarch Cañon, elevation 10,600 feet. The following claims have been located: San Jose, McGinnis, Mankin, Aida V., and Zinc Blende, giving 3000 feet along the lode line.

Crystalline limestone seems to be distributed through the metamorphic slates and granites. The ore-bearing zone occurs along this contact, accompanied by an epidote dike. The ore is a complex lead-zinc sulphide, with an epidote gangue. San Jose-McGinnis vein is

from 18" to 3' wide and strikes N. 45° W., with a dip of 75° SW. A number of shallow shafts and short tunnels have been sunk along the outcrop of the vein. Shaft No. 1, near the NW. end line of the San Jose claim, is 25' deep, developing a vein 2' in width. About 100' southeast, No. 2 shaft was sunk to a depth of 10' on vein of high grade ore 18" wide.

About the same distance to the southeast of these workings there is a prospect shaft 10' deep on 3' of high grade ore. About 150' north an incline shaft has been sunk to a depth of 20' which shows a vein 2' in width. All these shafts are on the San Jose claim. The McGinnis claim joins the San Jose on the southeast and the vein is a continuation of the San Jose vein.

The northwest shaft on this claim is 25 feet deep on vein 3 ft. wide. About 50' southeast of this shaft is another shaft 30' deep showing 2' of ore; 100' north is another prospect hole 10' deep on 3' of ore.

On the southeast end of claim the metamorphic schist comes in contact with the granite. The Mankin is a parallel vein to the McGinnis; the ore is of the same character. This vein has been prospected by a number of shallow shafts and has a width of 12" to 18".

The Bessie V. vein runs north and south and intersects the San Jose-McGinnis vein on the claim. On this intersection a shaft has been sunk, which has developed a vein 12" wide. Two men employed on development work. W. F. Cord of Porterville, owner.

Meadows Group of Zinc Claims. These claims are situated 16 miles northeast of Springville, on ridge north of North Fork of Alder Creek, at an elevation 5200 feet. Claims: Snow Storm, Holy Terror and Big Ledge. Vein strikes N. 40° W., dipping 45° NE.; width 3 feet. Sphalerite occurs in an epidote dike on contact of a lens of limestone with a mica schist. The vein has been prospected by a number of open cuts and a short tunnel. Idle. Raymond Meadows of Springville, owner.

Monarch Group of Zinc Claims. The claims are situated 16 miles northeast of Springville, on ridge north of North Fork of Alder Creek, at an elevation of 5000 feet. Claims: Monarch, Susan Jane, Two Pines, Sugar Pine, Big Ledge, Ben Hur, Hapgood, Sweet Marie. The ore is a zinc sulphide occurring along epidote dikes, which cut the limestone and schist. George McGeorge, J. Sub Johnson and Frank Carson of Visalia, owners.

Peach Dumpling Claim. A prospect 15 miles northeast of Springville, on ridge north of Alder Creek. The ore is a zinc sulphide occurring in an epidote dike. Idle. Jack Dodge of Springville, owner.

Silver King Claim. It is 2 miles southeast of Mineral King, in Franklin Cañon below Franklin Lakes, at an elevation of 10,000 feet.

Lead-zinc sulphide ore occurs on contact of siliceous limestone and slate. The general strike of the contact is N.-S., with a dip of 75° NE. Developments consist of a number of shallow prospect shafts sunk along the contact. Idle. M. C. Griggs of Three Rivers, owner.

Silver Lake Zinc Mine. It is 2 miles southeast of Mineral King, on the slope of ridge north of Lower Franklin Lake, at an elevation of 10,600 feet. There are two claims, namely: Silver Lake and Dry Bone, with 3000 feet on lode line. The ore occurs on limestone and granite contact, running N. 30° W. It also occurs along an epidote dike which cuts a wide belt of coarse crystalline limestone; the width of this dike in places is about 40 feet. There is an open cut on the dike which has opened up 4 feet of high grade sphalerite. The gangue material is epidote, hornblende and siliceous limestone. This limestone belt outcrops strongly on the north side of the cañon, being cut by a number of epidote dikes which have a northerly and southerly strike. Developments consist of a number of shallow open cuts, all of which show zinc sulphide ore. Idle. T. J. Crabtree of Porterville, owner.

Silver Queen Claim. It is a prospect 2 miles southeast of Mineral King, located in Franklin Cañon, at an elevation of 10,000 feet. The ore occurs on contact between a siliceous limestone and a metamorphic slate. Sphalerite and galena in an epidote gangue. Idle. W. R. Wood of Three Rivers, owner.

Thunder Shower and Buckhead Zinc Mines. They are 16 miles northeast of Springville, in Sec. 5, T. 20 S., R. 31 E., on ridge north of North Fork of Alder Creek. Zinc sulphides occur along a contact between the limestone and the mica schist, which strikes N. 40° W., and dips 40° NE. At an elevation of 5200 feet, a crosscut tunnel 208' long intersects the contact 159' from portal of tunnel. From 6' to 8' of ore was cut on the contact. The limestone occurs in irregular lenses in a formation of mica schist, and along the contact of these lenses of limestone there are strong mineralized outcrops, showing some good grade zinc ore. Three men are employed on development work. J. M. Aikin, W. A. Alesler, of Springville, owners.

White Chief Mine. Situated 2½ miles south of Mineral King, in Sec. 31, T. 17 S., R. 31 E., in White Chief Cañon. Claims embraced in property are: White Chief, Luke, Grace G., White Cap, Silver Queen; with 3000 feet on the lode line. The original discovery of ore in the Mineral King district was made on the White Chief claim in 1873. An attempt was made to smelt the complex ores from this claim in 1879 and 1880, but with poor success. At an elevation of 10,000 feet, a crosscut tunnel runs S. 80° W., 195', the first 150' of which is through solid marble and the last 45' in granite, which contains considerable magnetic iron. The limestone belt is 100' to 200' in thickness and

strikes N. 35° W., its southwest wall being granite, while the northeast walls are slates standing nearly vertical. The surface contact between the limestone and the granite dips very steeply to southwest; it is in the limestone close to this contact surface that the complex ores have been found. The ore consists chiefly of galena and sphalerite carrying silver values. The ore croppings on the contact show a width of 6' to 8'. A shaft sunk on the contact to a depth of 10', about 150' above the mouth of tunnel, has developed 5' of ore, while only a narrow streak of ore was found on the contact in the crosscut tunnel. About 100' south of this shaft there is a prospect shaft 18' deep which has developed 7' of ore. Further south on this contact is a shaft 100 feet deep which was sunk through the contact into the limestone; some ore occurs on the contact but no ore was found below this point in shaft. Besides these workings there are a number of shallow open cuts and shafts on the contact. There is about 200 tons of complex ore on the different dumps. Idle. T. J. Crabtree, W. F. Cord, of Porterville, owners.

Bibl.: Report VIII, p. 646.

White Horse Mine. It is a prospect 1½ miles north of Mineral King, in Sec. 11, T. 17 S., R. 31 E., on slope of ridge southeast of Timber Gap, at an elevation of 11,400 feet. The ore consists of sphalerite and galena, occurring on contact of limestone and granite. Developments consist of several short tunnels and shallow prospect shafts. Idle. E. H. Kemble of Tulare, owner.

Young America Group of claims. W. F. Cord, of Porterville, has located the following claims in Secs. 1 and 2, T. 17 S., R. 31 E., on Cliff Creek: Young America, Rothschild, and Zinc King. The ore is a complex zinc-lead sulphide, occurring on limestone-granite contact, which strikes NW.-SE., dips 75° SW.

APPENDIX.

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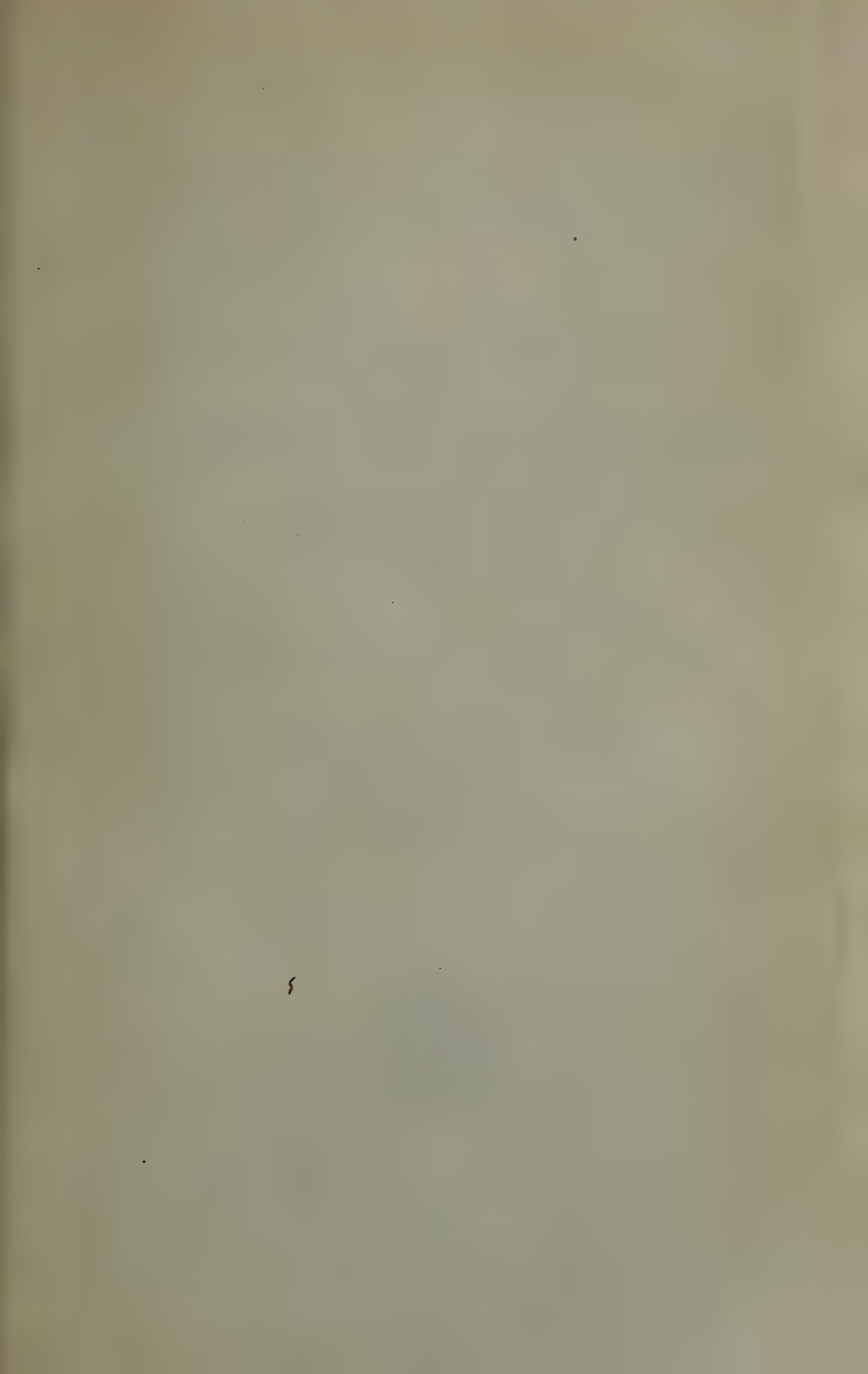
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State Mineralogist

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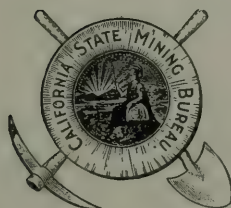
PRELIMINARY REPORT No. 6

[January, 1920]

A REVIEW OF MINING IN CALIFORNIA DURING 1919

WITH NOTES ON

THE OUTLOOK FOR 1920
LABOR CONDITIONS
NEEDS OF THE INDUSTRY



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO

1920

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LETTER OF TRANSMITTAL.

*To His Excellency, the Honorable WILLIAM D. STEPHENS,
Governor of the State of California.*

SIR: I take pleasure in submitting herewith Preliminary Report No. 6 entitled "A Review of Mining in California during 1919," which includes notes on the mining outlook for 1920, labor conditions, and needs of the industry.

The information contained herein has been made available as a result of the Bureau's recently inaugurated system of establishing branch offices in the mining regions of the state. No attempt has been made to present the material in particularly finished form, its value lying in the timeliness of its appearance and the definite manner in which the subject is discussed.

It is believed that this publication marks an innovation which will be appreciated by the general mining public, inasmuch as such authentic information is rarely to be had until much later in the year, if at all.

Respectfully submitted.

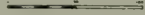
FLETCHER HAMILTON,
State Mineralogist.

January 1, 1920.

CALIFORNIA STATE MINING BUREAU
FLETCHER HAMILTON
STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



LEGEND

- Mining Division Boundaries
- Mining Division Offices.

MEXICO

A REVIEW OF MINING IN CALIFORNIA DURING 1919.

By FLETCHER HAMILTON, State Mineralogist.

The State Mining Bureau now has permanent field representatives in specifically assigned districts of California, and as a result of the personal contact with the mining industry thus achieved it is possible to approach nearer the goal toward which the Bureau is working, than at any time in its past history.

This goal is the carrying out, in letter and spirit, of the organic act under which the Bureau functions, which provides that its fundamental purpose shall be to aid in all possible ways in the development of the mineral industry of the state.

The above mentioned districts, with engineers in charge, are as follows:

Redding Field Division, E. Huguenin.

Auburn Field Division, C. A. Logan.

San Francisco Field Division, E. S. Boalich.

Los Angeles Field Division, W. B. Tucker.

REDDING FIELD DIVISION.

1. Scope of Industry in District.

The principal minerals mined in this district are copper, gold, platinum, silver, zinc and pyrites. During the war chrome ore was developed and produced in Del Norte, Shasta, Siskiyou, Tehama and Trinity counties. Asbestos, cadmium, clay, coal, iron, limestone, manganese, mineral water, quicksilver, volcanic ash and pumice have all been produced to a lesser extent, but the industry is dependent mainly upon the first group, each mineral of which will be considered separately.

COPPER.

Most of the copper produced in northern California is mined within a radius of twenty-five miles of Redding, in Shasta County, although there has been a considerable amount produced in Trinity County during the past few years. Siskiyou County has contributed a comparatively small production, as the copper deposits there are mostly beyond the present limits of economic transportation. In this regard the construction of the state highway down the Klamath River will be an important factor, as there are a number of deposits in that region. Notable among these is the Gray Eagle mine, owned by the Mason Valley Mines Company, of Nevada. It is estimated by the manage-

ment that over a million tons of chalcopyrite ore has been revealed there.

Practically all of the copper and zinc ore produced in Shasta County during the past year was mined by the five established companies as follows: Mammoth Copper Mining Company, Balaklala Consolidated Copper Company, Mountain Copper Company, Bully Hill Mines, Inc., and the Afterthought Copper Company.

During the war the ore bodies at the Mammoth mine were greatly depleted as all efforts were made to stimulate production so that comparatively little development work was done. This company continued to produce copper until the smelter was forced to shut down due to labor troubles in May, 1919. Since that time development work only has been done and a crew of sixty men are at work. Drilling operations at the Keystone mine of this company is proving the existence of a large ore body there. It has not as yet been decided when the smelter will be again blown in; this will be determined when the ore reserves approach their former status.

The Balaklala Consolidated Copper Company ceased mining in May with the closing of the Mammoth smelter, as all ore from that mine is smelted there. Development work was carried well ahead of stoping so that the company will be in position to produce ore as soon as the smelter is ready to receive it. The superintendent estimates one year supply (about 100,000 tons) blocked out ready for stoping.

At Iron Mountain the Mountain Copper Company continues to produce about 400 tons of pyritic ore daily from the Hornet mine, the only one of that group now being worked. As this ore body runs low in copper, less than one per cent, the greater portion is marketed for its sulphur content. The company utilizes some of it at their chemical plant for the manufacture of fertilizer. Since the closing of the smelter at Martinez in March no copper ores from the Iron Mountain mine have been mined and the oil flotation mill at Minnesota Station is idle. The ore reserves at the Hornet mine are enormous and the crushing plant below the mine has a capacity of 1000 tons daily. About 150 men are employed by the company, the normal force being 500.

The Bully Hill Mines, Inc., have been following a plan of development for the past two years at their Rising Star mine, to determine the extent of the copper and zinc ore bodies. In connection with this work a 150-ton capacity oil flotation plant was built to concentrate this ore. The mill, completed just as the war ceased, was operated but a few months, long enough, however, to prove that a selective concentration of these base ores was practical. As it is impossible to ship the zinc concentrate to Eastern smelters at a profit, due to excessive freight

and treatment charges, it is expected to install a plant for the manufacture of zinc oxide at the property. The flotation mill will concentrate the medium grade zinc and copper ores, while the high grade zinc ore, running 30 to 45 per cent Zn, will be treated without concentration.

At the Afterthought mine about a hundred men are at work. The orebody has been encountered on the eighth level, the lowest working, which was recently driven to cut it. A successful metallurgical treatment for this copper-zinc ore has been developed. This consists of making a selective concentration of the copper and zinc in the 300-ton oil flotation mill. The copper concentrate is roasted in a 9-hearth Wedge type roaster, then smelted in a reverberatory furnace, producing at present a matte which runs 18 to 20 per cent Cu. The furnace also treats the silicious copper ores from the mine which contain very little zinc. About 135 tons daily of this ore and concentrate is being smelted. The zinc concentrate is being stored for future treatment, as the company expects to put in an electrolytic zinc plant.

Besides the five producing companies described above there are two others that have been doing considerable work the past year, as follows: Atascadero Mining Company, who have taken over the Greenhorn mine, and the Pittsburg and Mount Shasta Mining Company, operating the Little Nellie. The Greenhorn mine, situated about twenty miles northwest of Redding, has produced at various times considerable copper ore which was shipped to the Mammoth smelter. Early in 1919 it was acquired by the present owners who are developing a large body of low grade sulphide ore. It is reported by the manager, Mr. A. Hanford, that there is at present about a quarter million tons blocked out that will average a little better than 3 per cent. Experiments for a chemical treatment for this ore, whose gangue is principally iron sulphide, have been made at the plant of the parent company, Metals and Chemical Extraction Company, at Melrose, and it is expected to build an acid leaching plant at the mine in the near future. The Pittsburg and Mount Shasta Company's property adjoins the Hornet mine on Iron Mountain. Here diamond drilling on the main adit of the Little Nellie mine, formerly worked for gold, is said to have proven the existence of a body of chalcopyrite ore. A contract was recently let for the sinking of a 500 foot shaft and a crew of twelve men are at work.

GOLD.

Gold mining in this district, as in all others, is under a severe handicap due to high costs so that most of the larger mines are now idle. The French Gulch district, the most famous gold producing district of

the north, is dormant. The two principal mines in Shasta County now in operation are the Reid mine at Old Digging and the Midas mine in Harrison Gulch. The Reid is a low grade gold quartz mine which ships all of its ore to the Mammoth smelter, supplying it with silica for flux. The striking of a rich ore shoot at the Midas during the past year is of particular interest, as the mine, credited with a production of over three and one-half millions, is generally thought to be worked out. A new reduction plant equipped with four 30-ton Gibson mills is treating the ore, and a force of twenty miners is at work.

In Siskiyou County a number of the old mines were reopened, including the Eliza, Highland, Hoboken, Homestake, and Quartz Hill mines, all of which are again producing gold.

In Trinity County also several of the old producers are again being developed. Twenty men are working at the Bonanza King mine, above Carrville, and the stamps are dropping on high grade ore. The Globe mine, above Dedrick, has been acquired by Buckley Wells and associates, and considerable development work is in progress. The Fairview mine, near Minersville, is also being reopened; the old 40-stamp mill, however, has been dismantled. In Lassen County, the Juniper mine at Hayden Hill is the only one of the district being developed. Several prospects in the vicinity of Westwood are being developed in a small way. With the exception of the Hess mine, where a few men are at work, gold mining in Modoc County is at a standstill.

There has been increased activity and production of gold dredging during the year. The following gold dredges are at present operating:

- Shasta County: 3 dredges.
 - L. Gardella, 2 dredges on Clear Creek.
 - American Gold Dredging Company, 1 dredge on Sacramento River.
- Siskiyou County: 2 dredges operating.
 - El Oro Dredging Company, 1, mouth of Greenhorn Creek.
 - Siskiyou Dredging Company, 1, McAdams Creek.
- Trinity County: 4 dredges operating on Trinity River.
 - Estabrook Gold Dredging Company, 1.
 - Pacific Gold Dredging Company, 1.
 - Trinity Dredging Company, 1.
 - Valdor Dredging Company, 1.

The dredge of the Estabrook Company, which is said to be the largest wooden dredge in the world, is equipped with 20-foot buckets. It started digging last June.

Due to the unusual circumstance of having a succession of dry years with little snowfall in the mountains, the few hydraulic and placer mines that could withstand the high operating costs were able to be worked but part of the normal season. The Le Grange mine, largest hydraulic mine operated in recent years, was forced to suspend operations last year, due to high costs. Several of the placer mines along

the Klamath River are preparing to resume work in the spring and some of the old ditch lines are being repaired. The Rexbury hydraulic mine on the Scott River, near Hamburg, is again at work.

SILVER.

Some attention is being given to the silver mines in the vicinity of Igo, Shasta County. The 3000-foot adit of the old Chicago mine is being cleaned out and track laid, preparatory to further development work.

CHROME.

As previously stated, chrome mining became an important industry in this district during the war, as many deposits were developed in the serpentine areas of Del Norte, Shasta, Siskiyou, Tehama and Trinity counties. The sudden collapse of the market last year put an abrupt end to it. Many hundred tons of chrome ore were hauled to points along the railroad in both Shasta and Siskiyou counties just before the market broke, so it was not shipped. Under a more favorable market large tonnages of this ore would be mined. The enormous low grade ore bodies that have been revealed in the Klamath River region offer excellent inducement for concentration, especially as water power could be developed at most of them with little cost.

OTHER MINERALS.

Other minerals that have been produced to a lesser extent are asbestos, coal, iron, limestone, and quicksilver. A small amount of platinum is recovered in gold dredging and occasionally at the larger hydraulic mines. Within the past few months a discovery of this precious metal was reported to occur near the head of Beegum Creek, about fifty miles southwest of Redding.

Very little work has been done on the iron ore deposits along the Pit River since the closing of the Noble Electric Steel Company's furnace at Heroult. An occasional carload of the iron ore is shipped to the Judson Iron Works on San Francisco Bay. As the Noble Electric Steel Company is in the hands of a receiver it is very doubtful when operations will be resumed at that smelter.

Comparatively little attention has been given to the extensive limestone deposits of Shasta County, and only those in the vicinity of Kennett have been mined during the year, supplying the Mammoth smelter with flux.

2. Production for the Year.

The copper and zinc production of 1919 will be less than one-half of that of 1918. This is due to the closing of the Mammoth smelter in May, which treated ores from the Balaklala and Bully Hill mines as

well as those of the Mammoth company, and the closing of the Mountain Copper Company's smelter near Martinez. Production of copper matte at the Afterthought and shipments of high grade ore from the Bully Hill constitute the present copper production of this district.

Gold production should show an increase over the 1918 figures due to the reopening of the several producing mines listed previously, and the increase in gold dredging. It will not, however, approach the production of those years just previous to the war.

Silver production will be less, probably in close proportion to the copper production, as the greater amount of this metal recovered is associated with the copper and zinc ores. The increase in the amount associated with gold will be comparatively small.

Pyrite production will equal if not exceed that of 1918, as the Mountain Copper Company continue to ship about 400 tons of 45 per cent ore from the Hornet mine.

No chrome ore was produced during the year.

Both iron ore and limestone production will be very much less than that of 1918, due to the closing of the Mammoth and Heroult smelters.

3. Outlook for 1920.

There should be a heavy increase in the production of copper, silver and zinc in 1920 under favorable market conditions, due to the developments outlined above at the various properties, and the operations of their reduction plants, as listed below.

Afterthought Mine. 300-ton oil flotation plant for selective concentration of copper and zinc; 200-ton reverberatory furnace for producing copper matte. Proposed erection of electrolytic zinc plant.

Bully Hill Mines. 150-ton oil flotation plant for selective concentration of copper and zinc. Proposed erection of zinc-oxide plant.

Greenhorn Mine. Proposed acid leaching plant and chemical works.

Iron Mountain. 500-ton oil flotation plant of Mountain Copper Company. Reverberatory furnaces and acid works at Martinez; 1000-ton crushing and sorting plant of Hornet mine.

Mammoth Mine. Renovation of the 1000-ton custom smelter.

Gold production should be greater in 1920 than in 1919, but comparatively little quartz mining may be expected here until there is a decrease in the high price level. Dredge operations will be probably more extensive as several tracts of river land in both Shasta and Trinity counties are being prospected for that purpose.

4. Labor Situation.

During the war there was a shortage of miners in the district, as many deserted the camps here for the copper camps of Arizona,

Nevada and Montana where higher wages prevailed. With the closing of the larger mines here in the spring, many men were out of work and since that time labor has been plentiful. The wages paid at all of the camps here are now \$4.50 for miners and \$4 for muckers, as compared to \$4 and \$3.50 paid them last year. A few years ago the wages were \$3.50 and \$2.75. All of the companies operating report that at the present wage scale labor is plentiful.

5. Generally Recognized Needs of Industry.

The greatest needs of the mining industry here are better transportation facilities and lower freight rates, particularly on custom ores. The copper camps of Shasta County are easily accessible to railroad points, the most distant ones such as Bully Hill and Afterthought owning narrow gauge lines which connect with the Southern Pacific Railroad. Those of Siskiyou County, however, are all at considerable distances from shipping points and can be operated only under the most favorable conditions. The gold camps are all rather inaccessible and dependent upon motor truck transportation for their supplies. Most of those of Trinity County are isolated during the winter months as the old county roads become impassable in wet weather. The new state highway system will be a great aid to many of the districts, notably the Redding-Weaverville lateral, giving access to French Gulch, Deadwood and Lewiston districts; the Klamath River highway, following the Klamath from Hornbrook in Siskiyou County to its mouth at Requa, Del Norte County; and the Redding-Alturas lateral which will give access to isolated districts in Lassen and Modoc counties. These highways will be kept open all year upon completion and should reduce materially present transportation costs.

AUBURN FIELD DIVISION.

1. Scope of the Industry.

The district has valuable deposits of the following minerals: Asbestos; barite, brick clay, building stone, coal, chromite, copper ores, fire clay, glass sand, gold, granite, iridium, iron ores, limestone, manganese, magnesite, marble, mineral pigments, mineral water, molybdenum, osmiridium, platinum, pumice, pyrite, quartz crystals, slate, soapstone, tungsten and zinc. There are, of course, a great many occurrences of other minerals which are principally of scientific interest.

The district comprises the foothill and mountain counties on the western slope of the Sierra Nevada Mountains. In the middle courses of the rivers which flow down this slope, from the points where they break from their rocky canyons to the region of their flood plains, are located the gold dredging fields. Eastward, beyond the mantle of younger sediments in the area of metamorphic rocks, are the foothill

copper belt, the Mother Lode, the East Belt, and the Nevada County gold belt, as well as the promising quartz veins of Placer, Yuba, Butte and Plumas counties. At the north lies the great copper belt which is being opened at the Engels and Walker Brothers mines, but the exact extent of which is not yet known. Traversing the Sierra slopes from east to west are the deep Tertiary auriferous gravels marking the courses of the ancient rivers. All through the mountains and foothills are to be found deposits of industrial materials.

Hydraulic Mining. Much has been said and written about the means that ought to be taken to revive hydraulic mining in the Sierra Nevada. Without going into the feasibility of these schemes, it may be said that hydraulic mining on a large scale, as it was carried on in the eighties, will probably never be seen again. However, there is a renewed interest in this form of mining by the use of restraining dams which prevent the debris from being carried down the streams into the Sacramento River. Particular activity has been noted in the Brandy City district and other operations have been reported in Plumas, Sierra and Nevada counties.

Drift Mining of deep gravels offers a wide and promising field in this region. Where pumping and hoisting can be obviated, there is a chance even under present adverse conditions, to operate at a profit a large number of properties. Under favorable conditions the cost of operation today need not exceed \$2 a ton; so it is only natural that there is a great deal of development of small drift mines going on now in the mountain counties. The Keystone drill is being used more and more for prospecting buried gravel and marks a great advance over the old way of blind burrowing with pick and shovel.

Gold Dredging continues with less serious interruption than other branches of mining, the main difficulties encountered having been the increased cost of electric power, the cost and scarcity of steel equipment, and demoralized transportation. New construction was nearly impossible during the war, but for boats already built the increased cost of operation was not critical. Some of the older fields are becoming exhausted. Future production can not be expected to increase except as it may be speeded up by increased operations in three or four fields. There are no more great fields left to discover in the state.

Quartz Mining. The past year has seen the temporary closing of four of our principal producing mines and the protracted or final closing of many smaller ones whose owners do not feel justified in trying to mine under present adverse conditions. The North Star and Empire lost considerable time on account of labor troubles, and the Argonaut and Kennedy because of fire and gas. The Morgan mine, a phenomenally rich producer, entered the lists early in the year,

however, and its output has done much to compensate losses from other sources. Gold dredging, too, has no doubt shown some increase.

Starting at the southern end of Tuolumne County, we find the Belmont Shawmut operating at two-thirds capacity, milling three hundred tons of typically low grade Mother Lode ore a day. This company is using stamps, Jones-Belmont flotation machines and tables. This company is mining and milling for less than any other noted on the Lode or elsewhere, because they have large reserves of ore opened, but the margin of profit is not what it should be. Flotation gives good recovery, but the smelter objects to handling the concentrates because, they claim, the oil used discolors the sulphuric acid which is made as a by-product before the gold is recovered. There is also the difficulty of keeping the concentrates clean enough without an unduly high loss in the tailing. The smelter wants 25 per cent excess of iron over silica, and imposes heavy penalties if this proportion is not maintained. With a \$50 concentrate there is a tailing loss of 41 cents; with \$39 concentrate, the loss is said to be 30 cents. With low grade ore the difference of 11 cents is critical.

Farther north at Quartz the Dutch-App group under the direction of William J. Loring is being reopened and milling is going on at one-third capacity. This company uses Hardinge mills, sluice plates, Mineral Separation and K & K flotation machines and Wilfley tables. On account of operating on a reduced scale, costs are high now and not representative.

In Calaveras County the condition of mining on the Mother Lode is a little better than in Tuolumne. Entering the county at the south, we find the Melones mine shut down with scant prospect of reopening. Low grade ore, increasing cost of operation and boundary troubles with neighbors all conspired to stop operation. Directly adjacent to Melones the Calaveras mine is being prospected on a working scale by the same company working the Morgan mine, under the management of William J. Loring. Even with the high costs incident to development and small scale operation, some ore shoots have been opened that can be mined profitably, and the map of surface tests indicates a good sized property.

The successful operation of the Morgan mine has been the sensation of the year in California mining. To date nearly 60,000 tons of ore have been milled since January, 1919. The average heads for the first six months were \$14.30 a ton and have shown constant improvement, going over \$16 a ton in September. Milling consists of crushing to 20-mesh with twenty 1250-pound stamps, classifying, overflow going over plates, and sand to Hardinge mills for regrinding; thence over plates to Deister simplex sand concentrators and Deister Plat-O sand

tables. The product is subsequently cyanided. The finding of such a fine orebody on the hanging wall of the bull quartz vein illustrates well the chances of mining. Only a few feet away the Melones company has worked for years on the footwall side of the same vein, on very low grade ore, and had attained a depth of 3500 feet on the vein with very little ore on the hanging wall side of the bull quartz. On the 550-foot level the Morgan ore shoot is 165 feet long and 31 feet thick; on the 675-foot level, 150 feet long and 30 feet thick, and it is strong on the 865-foot level. With such ore the cost per ton is not so important as to the ordinary Mother Lode operator, the cost of mining and milling, with the exception of certain items for conveying and railroad freight are representative of what it costs to mine a large orebody in California now. The following figures for July and for the preceding six months have been kindly furnished by Mr. Loring:

Driving		\$8 87
Cross-cuts		7 82
Raising		14 22
Mining items—ton mined.		
Labor		\$0.776
Explosives .....		.193
Timber .....		.041
Carbide .....		.009
Tools .....		.093
Steel .....		.015
Sundry .....		.033
Power .....		.042
Sampling and assaying.....		.014
Repairs and maintenance.....		.036
Surveying .....		.004
Ore treatment costs, including crushing, conveying, railroad freight, marketing and tailing loss.		
	July	Six months period
Crushing and conveying.....	\$0.075	\$0.097
Railroad (ore) .....	.421	.514
Stamping .....	.246	.239
Amalgamating .....	.080	.094
Regrinding, Hardinges .....	.209	.204
Concentrating .....	.055	.107
Treating tailing .....	.039	.031
Disposing of residue.....	.003	.004
Marketing concentrates (including pump sand and slime and tailing loss)....	1.061	1.159
Marketing bullion .....	.049	.029
Total.....	\$2.238	\$2.511
Summary of cost of operation on basis of tons milled.		
Ore extraction	\$1.635	\$1.819
Milling	1.128	1.324
Marketing	1.110	1.188
General expense .....	.752	.805
Total operating	4.625	5.136
Development .....	.414	.648
Total.....	\$5.039	\$5.784

The high cost of transportation is due to the hauling of ore over the Sierra Railway about three miles from the mine to Melones, where the mill was built with the idea of using it for both the Calaveras and

Morgan mines. There is direct underground connection from the Morgan mine through the old Melones workings to a point not far from the new mill and if this fact could be taken advantage of the cost of operation could be reduced probably to about \$4.75 a ton. This figure represents about as low a cost of operation as can be hoped for at present. Any property working Mother Lode ores for less is doing it either at the expense of the future of the property or because, as in the case of the Belmont Shawmut, they have ore blocked out ready to mine for a long time to come, and do not have to carry on current exploration and development.

The only other producer of consequence on the Mother Lode in Calaveras County is the Gold Cliff mine of the Utica Company. The deepest working level of this mine is at 1900 feet. They are running forty stamps and milling 225 tons a day. The ore is of good grade and the company is making some profit. The Utica, Angels and Lightner mines appear to be closed permanently.

In Amador County the most important setback to production has been the fire which broke out in the Argonaut on March 27 and also affected the Kennedy. The mill at the Argonaut lost about two months time.

The South Eureka was closed early in 1918 because of impoverishment of ore, increased costs and unwillingness of stockholders to spend more money at present for sinking and exploration. The old Eureka has so far made no production.

The Central Eureka is now operating at depths of from 3500 to 3700 feet, and have an ore body which shows considerable free gold. Here again persistence has won and the company reports show the mine in the best condition for over ten years. The full plant of forty stamps with a capacity of 5000 tons a month has recently resumed operation, and operations for October show a net profit in spite of the fact that the closing of the South Eureka makes it necessary for the Central Eureka Company to pump the water from both mines. The ore in the new shoot is comparable in grade to that found at the Morgan mine, although of course geological conditions are different. Success at the Central Eureka is bound to have a good influence on its neighbors.

From Sutter Creek to Plymouth a long stretch of the Lode has recently been supporting only three producers, the Treasure, Keystone and Bunker Hill. The Fremont, in operation about twenty-five years, closed late in 1918. It had a mill capacity of 6000 tons a month and was operating on typical Mother Lode ore. The Keystone has been shut down during the past month until the tailings dam could be raised. The Bunker Hill and Keystone have been

operating at practically no profit, if not at an absolute loss, during the past few years. The cost of operation and the output have been about equal, and neither property has been able to carry on the requisite amount of development work. Costs have been over \$4 at the Bunker Hill.

Plymouth Consolidated at last account had a cost of about \$4.60 a ton. In spite of the average low grade of most of the ore handled, this property returns a net profit because they frequently find small bodies of rich ore which raise the average value of mill heads a good deal. According to Mr. Loring these rich shoots have come with comforting regularity.

There are no producers on the Lode north of Plymouth at present.

The consequences of the labor strike at Grass Valley in June have been felt all summer, as normal operations in the deeper levels of the Empire and North Star were not resumed till late in September. Cost of mining has been given another boost by the 10 per cent raise promised to all men who remain in the service of the respective companies for three months at least. The bonus system in the North Star was unsatisfactory and was superseded by the new agreement.

The Golden Center and Union Hill mines, both producers, have closed down during the summer. The Empire is adding twenty stamps to its mill in preparation for closing the Pennsylvania mill; the Pennsylvania ore will be trammed to the Empire mill in the future. The Norambagua and Kenosha are being reopened and both should become producers soon.

Two larger and promising ventures are the reopening of the old Idaho-Maryland preparatory to exploration, and the formation of a company to unwater and explore the Bullion group. These projects will both require a lot of time and money, but fortunately they both seem to be in the hands of capable companies with ample finances.

At Nevada City the Champion mine of the North Star Company remains the only producer, but plans are under way for the opening of two other mines next spring. Good ore has been found in the deep levels of the Providence in the Champion group and profitable operation can be expected after a long period during which the property has been a burden to the company. The ore contains 6 per cent or more of sulphides and is amenable to flotation, which process may be installed.

In Sierra County the Alleghany district has been very quiet, with only a few batteries of stamps running. The Tightner and Plumbago have been closed and operation of the Sixteen-to-One and Twenty-One have been interrupted by a lawsuit arising out of alleged invasion of the Sixteen-to-One vein by the other company. The Tightner and

Sixteen-to-One will resume work soon, the former under new management. There is not known to be any good ore in sight in the Tightner, but the new operators are relying on the mine repeating its past history. The Monarch and Cleveland properties near Sierra City have been in steady operation this summer.

Industrial Minerals and Base Metals.

The gold mining industry in the district is of predominating importance, and has overshadowed the possibilities which lie dormant here for the development of many enterprises which depend on the humbler members of the mineral family. The metamorphic rocks of the Sierra Nevada contain many valuable deposits other than gold, and a few of these will be mentioned.

Asbestos has been mined and milled lately in two localities, in Nevada and Calaveras counties. The former property is equipped with a remodeled stamp mill and a fiberizing plant. It has been successfully operated for two seasons, turning out four or five grades of chrysotile asbestos. The better grades have been sold in competition with Canadian fiber, and the lower grades, including that classed as asbestine, have been used in patent composition flooring and stucco made by a San Francisco firm.

Barite is being mined at a Nevada County property which was first worked this year. It shows a large enough tonnage actually in sight to supply the Pacific Coast for at least a decade, and a process of refining it has been worked out which promises to relieve the local consumers of the necessity of bringing in barite from east of the Rocky Mountains.

Chrome. The market shows some life. There have been some sales of high grade ore at 50 cents a unit, and some small contracts have been entered into at this price, f.o.b. shipping point. One plant making a 50 per cent concentrate has just resumed milling, and two others are reported getting ready to produce. The demand is small, however, and as far as the producer of low grade ore is concerned, there is little future unless he has a mill, near the railroad. El Dorado, Placer and Nevada counties were leading producers during the war.

Copper production has been curtailed or suspended at many properties pending a rise in the market, but many mines are active in the Plumas copper belt. The Engels Copper Company will probably be the state's leading producer again this year. Walker Brothers mine has been keeping several large auto trucks busy hauling concentrate this summer, pending the completion of a new tramway to the Western Pacific Railway. Several small properties have been active near Engels but the full extent of this copper belt has not yet been determined.

Engels Copper Company has been very fortunate in treating their ore by straight flotation as there is no iron sulphide in the ore and the result is a product of much higher copper content than is possible with the ores of Calaveras County. In the latter county there have been some closures of properties and a curtailment of operation in general.

Granite of fine quality occurs in Placer County in abundance near the railroad and the business of cutting it for building purposes formerly gave work to several hundred men. Demands of labor for higher pay and competition of artificial building products have driven this stone out of the market, and there is very little being done with it now.

Manganese mining is dead except for small shipments of high grade ore from one property.

Limestone of various grades is abundantly distributed in the district, especially in El Dorado and Tuolumne counties, but few deposits have been utilized as yet. One quarry in El Dorado County turns out 1200 tons daily which is shipped to a bay county cement plant. Two or three other quarries yield small tonnages, but the full utilization of our limestone awaits the exhaustion of deposits nearer the bay region.

Marble of fine quality occurs in immense beds in Tuolumne County. This stone is superior in hardness and compressive strength to any other with which it has come into competition and is obtainable in all gradations of veining, from pure white to dark gray. It has established a place for itself in the Pacific Coast market, but has not been able to compete in other fields on account of transportation costs. At present there are very few large buildings being constructed and two quarries are working at only part capacity.

Many molybdenum prospects were found in the granite areas of the Sierra Nevada during the war. There was no production worth mentioning in the state, however, and nothing is being done with the properties which are known in Placer, Sierra, Nevada and Plumas counties.

Platinum, osmiridium and iridium are recovered from gold dredging operations in practically every field in this district. The quantity is small, being in all about 600 crude ounces a year for the state, but it represents most of the domestic production of these metals. The dredgers of the Yuba and American rivers recover most of this.

Pyrite was produced during the war from one property in El Dorado County and was used to make sulphuric acid. At present the concentrates from gold mines in the district are treated for a like purpose before the recovery of the gold. In normal times the supply of raw material for acid making far exceeds the local demand, and

transportation cost precludes the idea of going farther east for a market.

Quartz for flux and other uses is plentiful in the district. A new industry sprang up in Amador County during the war to supply clean quartz sand for glass making. At present there is a plant in operation in that county to supply pure quartz sand for the manufacture of sodium silicate. The sand of the Ione formation is washed and separated from clay, chromite and other dark minerals which occur in it in small quantity. The final separation is made on ore concentrating tables.

Slate of excellent quality for roofing occurs in El Dorado County, but there is no present market for it.

Scapstone is being mined in El Dorado County for use in ready roofing and fireproof paints. It finds a market in the state.

Tungsten was mined during the war in the Union Hill mine near Grass Valley.

2. Production for the Year.

Exact figures of production can not be given at present, but there is enough data at hand to give an idea of the probable output compared with the year 1918. On the Mother Lode, Tuolumne and Amador counties will show a considerable decrease in production on account of the closing during 1918 and 1919 of the following mines, either permanently as seems now to be the case with the South Eureka, Fremont, and Amador Consolidated; or temporarily as in the case of the Keystone, Argonaut and Kennedy. Exhaustion of ore reserves in some properties and shortage of labor may also tend to lower the tonnage of ore and reduce gross yield. The output may be 20 per cent lower than last year.

In Calaveras County there will be a big gain in yield. The Angels mine, with a capacity of 6000 tons a month, quit work in March, 1918, and Melones mine, with a capacity of 15,000 tons a month, quit milling in February, 1919. To balance these losses there will be the production of the Morgan mine, and the net gain from this source will probably give the county a gold output of at least half a million dollars in excess of that for 1918.

In Nevada County there may be a decrease of at least 10 per cent in gold production as compared with that of 1918.

Sierra and Plumas counties may maintain their output as the result of contemplated operation of hydraulic and drift mines, even though there has been little quartz mining in either county this year.

Butte County, because of the exhaustion of the Oroville dredging field, will show a large decrease in gold yield.

Yuba County will no doubt show some gain. There has been a tendency to increase the scale of operation in the Hammonton field for many years and this has been reflected in a steady increase in gold production since 1915. The present season has been favorable for dredging as there has been no high water yet to hinder work. The other dredging fields should maintain about the same rate of yield as last year.

There has been some enlargement of hydraulic mining operations which may result in a small increase in production. No new producing drift mines of importance have entered the field, and though the drift mining industry offers great promise most of the properties visited are in the development stage.

3. Outlook for 1920.

On the Mother Lode there is definite promise of increased gold production in 1920 from the Dutch-App group in Tuolumne County, the Morgan and Calaveras Consolidated mine in Calaveras County, and the Central Eureka in Amador County. There are other properties capable of increasing this year's figures if they can get more and better labor next year. Besides these, there are some mines in the prospective stage which may develop favorably during the year. If conditions do not improve there will be further closing of low grade properties, which are holding on at present in the hope of better times. If the statements of operating officials are correct, there is a possible loss of over 125 stamps from this cause.

The East Belt in Tuolumne and Calaveras counties promises production next year. The mines looked to for this are the Sheep Ranch and Black Wonder in particular, and there are some others in the West Point and Railroad Flat districts in Calaveras County and in the Tuolumne and Confidence districts in Tuolumne County which ought to become productive. This region has problems in ore treatment to solve.

If conditions permit steady operation next year there should be increased yield from operations in Nevada County. In spite of labor unrest and costs of operation, conditions are much better here than on the Mother Lode. The Norambagua, Champion and Kenosha should help to swell the steady production which may reasonably be expected from the North Star and Empire. The Idaho Maryland is already unwatered to the 400 foot level. Conditions underground will entail considerable dead work before real production commences.

There are no particular reasons at present for expecting actual production at an increased rate from quartz mining in the other counties of the group, but all conditions point to increased interest in mining and a return of capital to legitimate mining projects.

In drift mining, however, there is room for optimism. Many properties have been brought during the past year to a point of development where actual production should begin soon. These properties are located chiefly in Placer, Sierra and Plumas counties. It is true that many of them are employing only a few men, but once opened and shown to be profitable, they will possess great possibilities.

4. Labor Situation.

Labor is scarce in nearly every camp in the district and some operators state that they are not able to do the needed amount of advance development work because of this scarcity. The quality of service rendered is also said to be far below pre-war standards. Men are not particular whether they keep a given job or not, as there is usually another waiting for them. Where the scale was formerly \$2.50 to \$3 a day, it now runs from \$3.50 to \$4.50 for underground work. These figures are reflected in increased cost of operation in mining as in every other business, but the gold miner has no present means of relief.

5. Generally Recognized Needs of the Industry.

The easiest way and the quickest way to solve the gold miners' difficulties would naturally be to raise the value of his product. It is suggested that this could be done without disturbing the financial balance of the world, if the government could find some way of controlling the total output of the country's gold, taking so much of it as may be required for coinage at the present rate, and establishing for the remainder, which is used solely in the arts, a higher price than the present standard. This would require the accounting for all coined gold, but most of this appears to be in the hands of the government anyway, so this step would not be as sweeping perhaps as it seems. The government would be then the sole dealer in gold. The result would in effect be a tax on those industries using gold and as times returned to normal this tax could be lightened.

Putting aside the possibility of this, there are certain remedies that could be applied to help gold mining in California. One of these is a lower industrial accident insurance rate. Another remedy is government control of prices of explosives, steel and other commodities used in mining. A third means of relief would be reduced railroad rates for concentrates enroute to smelters, especially from properties known to be operating at little profit.

SAN FRANCISCO FIELD DIVISION.

1. Scope of the Industry.

The San Francisco District, consisting of twenty-eight counties, embraces the Central, Western, and Valley counties of the state, extending from Mendocino and Glenn counties on the north, to and including Monterey, Kings, and Tulare counties on the south; also the southern Sierra Nevada District, covered by the counties of Fresno, Madera, Mariposa and Mono. The district includes about 300 miles of the Coast Range, with the foothills and valleys to the east, and also quite a portion of the foothill and high mountain belt of the Sierra Nevada; consequently a great variety of commercial minerals are produced, including most of the structural and industrial materials, as well as the metals.

The most important mineral products are: asbestos, barytes, bituminous rock, brick and tile, chromite, cement, clay, coal, copper, diatomaceous earth, dolomite, feldspar, gems, gold, granite, lead, lime, limestone, magnesite, manganese, mineral paint, mineral water, miscellaneous stone, natural gas, petroleum, platinum, potash, pyrite, quicksilver, salt, silica, silver, soapstone and talc.

In the order of their value, the several leading products of the district are as follows: (1) petroleum, (2) cement, (3) quicksilver, (4) gold, (5) miscellaneous stone, (6) brick and tile (including pottery clay), (7) magnesite, (8) salt, (9) manganese and (10) chrome.

Fresno County leads all others in the value of mineral products, due to the petroleum output. Following, in order of value of products, are Santa Cruz, Sacramento, Santa Clara, Napa, San Benito, Solano, Contra Costa and Alameda counties.

2. Production for the Year.

The district produces practically all of the quicksilver and magnesite which is marketed in the state.

Quicksilver mining has been an important branch of the mineral industry in California since 1850, during which period more than 2,000,000 flasks, having a market value of approximately \$105,000,000, have been produced.

There are on record several hundred quicksilver mines and prospects in the state, but not more than ten of these have reported any production for 1919, and that production has been intermittent and small. The actual figures for the year are not now (December 11, 1919) available, but it is doubtful if the output of the state will exceed 17,000 flasks, as compared to 22,621 flasks in 1918. About 50 per cent of this output comes from the New Idria mine in San Benito County, which is equipped with five rotary furnaces and under normal conditions employs about four hundred men.

The Quicksilver Mining Company at New Almaden and the New Guadalupe, both in Santa Clara County, report a small production, probably about one-fifth normal.

The Oceanic mine in San Luis Obispo County had one of its two 50-ton Scott furnaces shut down for most of the year. The Western Mercury Company installed a rotary furnace at the Cloverdale mine, Sonoma County, and has made a considerably increased production for 1919. The Oat Hill mine, Napa County, has been reopened, and newly equipped with a 40-ton Scott furnace by the lessee, Mr. Murray Innes, owner of the Oceanic mine, San Luis Obispo County, and has been producing since January. New features of this installation include a multiple-flue series in the condensing system.

The only additional mines which have attempted to operate at all are the Rutherford in Napa County, the Helen mine in Lake County, the St. John's in Solano County and the Dawson Lease in Kings County operated by the Patriquin Company near Parkfield, Monterey County.

The present cost of production just about equals the market quotation for quicksilver, and as a result the industry is merely marking time. It appears to be an assured fact that without protection, presumably by tariff, quicksilver mining in the United States will become a thing of the past, and if such an event transpires the consumers of this commodity in the United States will undoubtedly pay a handsome price for the privilege of using an imported article.

The final analysis of the competitive conditions which confront domestic quicksilver producers may be outlined as follows:

First: The ore deposits of foreign countries are of much higher metal content than those found in the United States. Spanish ore is said to average 11 per cent, Italian ore 0.8 per cent and Austrian ore 1 per cent, while the average tenor of ore mined in this country is less than 0.5 per cent.

Second: The cost of labor in foreign countries is much lower than in the United States; in fact the Spanish mines are operated with convict labor.

In addition to the above points, it is worthy of note that the Almaden mine in Spain alone, with its 11 per cent ore operated by convict labor, and its output contracted to the Rothschilds in London at \$34 a flask, has sufficient tonnage to supply the world for many decades to come.

Quicksilver is vitally necessary in the manufacture of fulminate, electrical apparatus, drugs, chemicals, and many other substances.

If the industry is to be preserved for the use of the nation it must be maintained in an operating condition, as the fact is well known that mines shut down and plants lying idle soon become inaccessible and worthless. The only sane conservation is that which would encourage

development of reserve ores and make possible a search for orebodies which today are unknown.

Magnesite.

Magnesite is produced, principally in the Porterville district in Tulare County, the Napa and Sonoma counties district north of San Francisco Bay, and in Alameda, Santa Clara and San Benito counties. At Porterville the Tulare Magnesite Company is operating at full capacity, calcining about 45 tons of crude ore per day, in one vertical furnace, which is kept burning continuously. A second furnace is operated at intervals for the purpose of burning "pure white" sorted ore.

The Porterville Magnesite Company is operating its large rotary kiln four or five days per week. About 70 or 80 tons of crude ore is being produced per day, and the kiln has a capacity of about 120 tons of crude ore per 24 hours, hence it is closed down two or three days per week, to allow sufficient ore to be accumulated for the next run.

The American Magnesite Company's plant at Porterville, which has been idle for some time past, has been purchased by C. W. Hill, who owns a controlling interest in the International Magnesite Company at San Diego. This plant will be in operation in a few days (November, 1919) calcining custom ore from many small properties around Porterville, Lindsay and Exeter. The outlook for 1920 is that there will be considerable increase in production from this district.

Gold.

Sacramento County is the leading gold producing county in the district; in fact, that county ranked fourth in the state, in gold production, in 1918. This is due entirely to the gold dredgers operating in the district around Folsom and Natoma.

The La Grange Gold Company's dredge, located at La Grange on the Tuolumne River in Stanislaus County, operated quite steadily during 1919, but at reduced capacity. Due also to the fact that the gravel deposit is not holding up to previous values, the output will probably be less than for 1918.

In Mariposa County several gold mines are operating on a producing basis. The Mountain King Mining Company, at Mountain King on the Merced River above Bagby, have been operating twenty of the thirty stamps in the mill, treating about 65 tons per day, which averages around \$6 per ton. This company has its own power plant on the river, but on account of low water in the latter part of 1919 (October and November), the mine and mill were not operating continuously.

The Original Mining and Milling Company, at Clearing House, also on the Merced River, about seven miles below El Portal, are operating a ten-stamp mill, three shifts. Here also low water in the river cut

down the power, which is generated in the company's plant, to such an extent that a 25-horsepower gasoline engine was installed to run the mill. In October, 1919, several hundred tons of \$4 to \$5 ore, which had previously been thrown on the dump, was being milled, because of lack of power to run the compressor and hoist. With more water in the river, and more power, both of these mines on the Merced River will, no doubt, increase their output to a considerable extent.

The Ruth Pierce mine near Hornitos has been operating a ten-stamp mill one shift per day for the last year and a half. Approximately 400 tons of ore per month is milled, which will average \$9 per ton.

The Virginia mine, near Coulterville, has been a continuous producer for many years. This is a ten-stamp mill and the ore averages around \$18 per ton. Three shifts operate the mill continuously.

In the latter part of 1919 there were several properties in Mariposa County which were being reopened, and no doubt some of these will be producers in 1920. The old Sweetwater mine near Jerseydale had been thoroughly sampled, and the ten-stamp mill was being overhauled, preparatory to beginning operation. The Silver mine near Mariposa, after much difficulty due to war conditions and water shortage, will probably be on a producing basis early in 1920. At the Carrie Todd mine near Kinsley it is planned to erect a ten-stamp mill in the near future. The old Quail mine, eight miles west of Coulterville, promises future production. The Number Nine mine, east of Hornitos, is in litigation over ownership. If this can be settled, the mine will immediately begin operating.

There are many properties in Mariposa County which appear worthy of further development or at least investigation, but capital does not appear anxious to invest in this district. There are several instances of poor management, where thousands of dollars have been spent on top of the ground, in mills and machinery, before the quality or extent of the orebody was determined, and these failures, combined with the facts that a great deal of territory (44,000 acres) are tied up in the 'Mariposa Grant' and the district is at the 'end of the Mother Lode,' have discouraged capital. Abandoned and idle properties are in the great majority. There are over two hundred more or less developed mines in the county, not counting mere prospects, and of these only four were operating on a producing basis in October, 1919.

In the White River district in Tulare and Kern counties, the Blue Mountain quartz mine was being reopened in November, 1919, by a company of which J. W. Howard was president and Rodney McCormick secretary. This mine promises production for 1920.

Chrome and Manganese.

During the war chrome and manganese were extensively produced, principally in the Livermore district in Alameda, Santa Clara, San Joaquin and Stanislaus counties, and in Mendocino, Sonoma, Glenn, Lake, Napa, Fresno and Tulare counties. Since the close of the war and the consequent break in the market there has been practically no activity in mining these minerals, only a few tons of high grade ore being produced.

Cement.

The district produces most of the cement manufactured in the state. Large plants are located at Davenport, Santa Cruz County; Cement, Solano County; Cowell, Contra Costa County; Napa Junction, Napa County, and a smaller plant at San Juan, in San Benito County. The production of these plants decreased in 1918 but the value of product increased. In a general way, the several plants maintain quite steady production, the demand for cement being regulated by the amount of concrete construction work. Some of the plants have not been working to capacity and it is difficult to state whether the production for 1919 will be greater or less than for 1918. It is quite safe to say, however, that the production figures will not be greatly changed. The prospect for 1920 is for an increase in production, due principally to increase in highway construction.

Stone.

Miscellaneous stone, including crushed rock, sand, gravel, paving blocks, etc., is produced in all but three counties in the district. The largest producing counties are Contra Costa, Alameda, Sacramento, Fresno, Sonoma and Tulare. The production is governed by demand in concrete buildings, highway construction, railway ballast, etc., and does not change materially from year to year.

Brick and Tile.

In the manufacture of brick and tile, San Joaquin, Alameda and Contra Costa counties are the largest producers in the district, followed by Sacramento, Fresno and Santa Clara counties. At all such plants, production in 1919 was maintained at about normal.

Salt.

Alameda County leads the state in salt production, followed by San Mateo. The production comes from many plants located on the tide lands of San Francisco Bay. These plants maintained production during 1919 at about normal.

Zinc.

The Butters electrolytic zinc refinery, located about two miles east of Martinez, Contra Costa County, began operating about the middle of the year 1919. Ore from the Afterthought mine in Shasta County is treated by leaching and electrolytic precipitation. The process is said to be highly successful and considerable custom ore, from various parts of the state, is also treated. The plant has a capacity of about three tons of metallic zinc per day.

Copper.

The Mountain Copper Company have for the last fourteen years operated a large copper smelter located on the south shore of Suisun Bay, about one mile northeast of Martinez. There is also a sulphuric acid plant and a fertilizer plant in connection with the smelter.

The plant was closed for several months in 1919, due principally to an over-supplied copper market.

When operating, it has a capacity of from 300 to 350 tons of crude ore daily, and employs between 150 to 200 men.

3. Labor Situation.

Labor in many branches of the mining industry has been scarce, and the quality is, in general, below the standard of a few years ago. This is entirely to be expected from the higher wages paid in other industries, and the inability of producers, especially the gold producers, to meet these high wages. The larger magnesite companies have been fortunate in keeping their entire crews. At the Tulare Magnesite Company's works at Porterville, many of the men, mostly Italian, have been with the company for from ten to fifteen years. A bonus is given the men for each additional year's service. The labor shortage has probably not been felt so much in this district as in the larger metal mining districts of the state.

At the Mountain King mine, Mariposa County, the following wages were paid in 1919: Foreman, \$175 per month; shift bosses \$5 per day; miners \$4 to \$5; timbermen \$4; shovelers \$3.75; trammers \$3.75; hoistmen \$4; blacksmiths \$5; timber-framers \$4.50; millmen \$4; general surface \$3.50.

4. Generally Recognized Needs of the Industry.

Probably the greatest difficulty met with during the last few months has been the shortage of railway cars for shipping. This shortage has been especially felt at the magnesite properties, rock crushing plants and cement plants. This difficulty was to be expected during the war, but there appears to be no excuse for such a condition at the present time.

Good roads for transportation by motor trucks are abundant, except in the more isolated parts of the district.

Tariff protection on imports would greatly aid the magnesite, chrome and manganese producers.

LOS ANGELES FIELD DIVISION.

1. Variety of Minerals Produced.

Antimony, asbestos, barytes, bituminous rock, borax, clay, cement, copper, chromite, diatomaceous earth, dolomite, feldspar, fullers earth, gems, gold, graphite, granite, gypsum, iron, lead, limestone, lithia, magnesite, manganese, marble, mineral paint, mineral water, molybdenum, natural gas, petroleum, potash, pumice, quicksilver, salt, silver, silica, soda, stone, strontium, tungsten, zinc.

Of the above minerals that have been mined in the district, only the properties producing at present will be outlined in the following summary under the heads of minerals and the counties wherein produced.

MINES AND PLANTS.

BORAX.

Sterling Borax Company, plant at Lang, Los Angeles County.

Pacific Coast Borax Company, operating mines and calcining plant at Death Valley Junction, Inyo County. Producing 50 tons of first class ore, and about 200 tons of second class ore. The first class ore is shipped direct to refineries at Alameda, California, or to Bayonne, New Jersey. All second class ore treated in plant at Death Valley Junction.

Pacific Coast Borax Company are reopening the Neel Borate mine near Daggett, San Bernardino County, and are shipping some ore to the refineries of the company.

Union Borax Company, with offices at 328 I. W. Hellman Building, Los Angeles, are developing a borate deposit on the claims owned by the company which adjoins the Neel Borate mine.

CLAY AND CLAY PRODUCTS.

Imperial County.

Simonds Brick Company, Los Angeles, operates a brick yard at El Centro; producing hollow tile, and common red brick. Capacity of plant, 50,000 bricks daily.

Kern County.

Bakersfield Sandstone Brick Company, plant at Bakersfield. Daily capacity, 40,000 bricks.

Kern County Brick Company, plant at Bakersfield. Capacity 37,000 bricks.

Los Angeles County.

J. A. Bauer Pottery Company, Los Angeles city, manufacturing flower pots, stoneware, vases, etc.

Furlong-Paxon Pottery Company, Los Angeles city, manufacturing white ware.

K. & K. Brick Company, Los Angeles city, manufacturing common brick. Capacity 74,000 bricks per day.

K. & M. Pottery, Los Angeles city, manufacturing stoneware.

Long Beach Brick Company, plant at Long Beach, manufacturing common red brick.

Los Angeles Brick Company, Los Angeles city. Company has three plants under operation with a capacity of 130,000 bricks per day.

Los Angeles Pressed Brick Company, Los Angeles city. This company is the largest manufacturer of clay products in the west, operating two plants in Los Angeles County.

Pacific Minerals and Chemical Company, of West Glendale; manufactures sewer pipe. The company is also grinding talc from its mine in San Bernardino County, shipping about a carload a day to eastern consumers.

Pomona Brick Company, of Pomona, manufactures common red brick. Daily capacity of plant 25,000 bricks.

St. Louis Firebrick and Clay Company, Los Angeles city. Company manufactures fire brick. Daily capacity of plant is 65,000 bricks.

Simonds Brick Company, Los Angeles. This company operates three brick yards in Los Angeles County, manufacturing common brick, red pressed tile, ruffle brick, hollow building tile and roofing tile.

Southern California Clay Products Company, Vernon. This company manufactures exclusively chemical stoneware, obtaining the clays from San Bernardino and San Diego counties.

Standard Brick Company, Los Angeles. This company operates two yards for the manufacture of common red brick. Daily capacity 40,000 bricks.

Standard Pottery Company, Los Angeles, manufactures flower pots, ollas, and china ware.

West Coast Tile Company. Purchased by the American Encaustic Tile Company, of New York. The company manufactures wall tile, trim tile, floor tile and faience tile.

Orange County.

La Bolsa Tile Company, plant at Smeltzer. The company manufactures drain tile.

Santa Ana Brick Works, Santa Ana, California. This company manufactures common brick. Capacity 40,000 bricks daily.

Riverside County.

Alberhill Coal and Clay Company, Alberhill, California. This company is the largest producer of clay in southern California, shipping a large tonnage of clay to the different clay manufacturers of Los Angeles city. Total amount of clay mined during 1918 was 70,000 tons.

Los Angeles Pressed Brick Company's plant No. 4 is located at Alberhill. It is at present consuming approximately 7000 tons of clay monthly in the manufacture of building tile and fire brick. All the clay is secured from the Alberhill Coal and Clay Company. Capacity of plant is 40,000 fire bricks per day and 200 tons of building tile.

Pacific Sewer Pipe Company. The company is manufacturing fire brick, sewer pipe and drain tile at its plant at Corona. The clay is secured from deposits owned by the company near Alberhill and Corona.

San Bernardino County.

The Southern California Clay Products Company, Los Angeles, are shipping clay from a deposit at Newberry, for the manufacture of chemical stoneware.

San Diego County.

Southern California Clay Products Company are mining and shipping clay from a deposit located east of Encinitas. The clay is used at the Los Angeles plant in the manufacture of fire bricks and crucibles.

American Encaustic Tile Company are mining and shipping to their plant at Los Angeles, a feldspathic rock, named duroe, from the vicinity of Dehesa, which is utilized for making tile.

Sunnyside Brick Company of San Diego is manufacturing building tile.

Union Brick and Tile Company of San Diego is manufacturing red brick at their plant in Rose Cañon.

Outlook for 1920.

Owing to the increase in building operations during the latter part of 1919, the prospects are bright for an increased production of clay products. The manufacturers, therefore, are looking forward to large demand for their products during 1920.

COPPER.

Due to the drop in the price of copper after the signing of the armistice on November 11, 1918, all developing and mining of copper ores was suspended.

The prospects look favorable for a revival of mining of copper ores, especially those containing silver values, for the coming year, as after the peace treaty has been ratified, there is every possibility of a large

demand for export to foreign countries, where the stock of metal is low. The renewal of building operations in the United States will also increase the demand for copper.

CHROMITE.

San Luis Obispo and Santa Barbara counties were large producers of chromite during 1918. Chrome mining in these counties has nearly ceased, and from January 1 to July 1, 1919, only two properties were under operation in San Luis Obispo. These two properties have recently suspended operations. Owing to the lack of demand and to the low prices offered for chromite, the outlook is not very favorable for any activity in this field.

DIATOMACEOUS EARTH.

The deposits of diatomaceous earth in the vicinity of Lompoc, Santa Barbara County, are said to be the purest and most extensive found in the state. The Celite Products Company are operating their property on an extensive scale, and are shipping a large tonnage to eastern points.

DOLOMITE.

Dolomite is being quarried from the deposits near Keeler, Inyo County, and shipped to the Soda Products Company's plant on Owens Lake.

FELDSPAR.

The American Encaustic Tile Company of Los Angeles are mining and shipping feldspar from a deposit located near Lakeview, Riverside County.

The material is used for glazing purposes at the company's plant in Los Angeles.

A number of deposits in the same district were worked during 1918 for the potash content, the material being used by the Riverside Cement Company.

Most of these deposits have been either worked out, or have suspended operations.

FULLERS EARTH.

A large tonnage of what is known as "Death Valley clay" is being mined from a deposit near Death Valley Junction, Inyo County, by the Standard Oil Company, and shipped to the refinery at El Segundo, California.

Rainbow Mining and Mineral Products Company, of Elsinore, Riverside County, are constructing a grinding mill for treatment of Fuller's earth. The deposit is located three miles north of Elsinore.

GEMS.

There was no activity in the mining of gems at Pala, San Diego County, during 1918 and 1919.

GOLD.

There is little stimulus for an increased production of gold, the added cost of materials and labor forcing many properties to suspend operations.

Gold production for 1919 shows a decrease from 1918 in Inyo, Kern and San Bernardino counties.

The prospects do not appear to be at all favorable for any activity in gold mining for 1920.

The following mines were under operation in 1918 and 1919:

Kern County.

Black Hawk gold mine, Johannesburg. D. A. Blue, owner.

Keyes mine, Isabella. Keyes Mining Company of San Diego. Five stamp mill.

Shipsey mine, Johannesburg. Owned by Shipsey Mining Company of Los Angeles. Operated by leasers. Five stamp mill.

Minnehaha mine, Johannesburg. Owned by E. B. Maguines of Randsburg. Operated by leasers.

Trio mine, Mojave District, has been reopened by Trio Mining Company of Los Angeles. Active development campaign planned by the company. Twenty stamp mill on property.

Yellow Aster mine, Randsburg. Operated by Yellow Aster Mining Company of Los Angeles. Property being operated on a small scale, selective mining of ore. Ten stamps of the 100-stamp mill crushing ore.

Zenda mine, in Amalie Mining District, is to be reopened by Zenda Mining Company.

Inyo County.

Wilshire Bishop Creek mine, Bishop, ten stamp mill and flotation plant.

San Bernardino County.

Gold Mountain mine, Bear Valley District, was purchased and reopened by James Hulme of Berkeley, California, in October, 1918, and has been under continuous operation since that date. Thirty stamps are crushing ore. On account of shortage of labor, operations will be suspended on December 1st, but it is planned to resume operations in the spring.

Brooklyn Mine, Virginia Dale District, owned by Brooklyn Mining Company of Highland, California. The company is doing some

development work on the property. Plant consists of a Nissen stamp mill and cyanide plant.

Twenty-Nine Palms District. The Gold Park Mining Company are doing some development work on the Black Warrior and other claims.

San Diego County.

The North Hubbard mine, Julian District, has been reopened, and a five stamp mill has been installed. J. W. Lyons of Julian, superintendent. Owners are Frank Talbott and Brohenshine of San Diego.

GRAPHITE.

California Graphite Company of Los Angeles are operating their graphite deposit in San Francisquito Cañon, eighteen miles from Saugus.

A new concentration plant has been installed, and recently placed in operation. The company is supplying the local market with material for foundry facings.

GYPSUM.

Riverside County.

The United States Gypsum Company are developing and operating a deposit northwest of Blythe, California.

San Bernardino County.

Consolidated Pacific Cement Plaster Company of Los Angeles. This company is working the Amboy Dry Lake deposit two miles southwest of Amboy. Capacity of calcine plant is 100 tons per day.

LIME.

Summit Lime Company, offices Los Angeles, California, are operating two plants at Tehachapi, Kern County, California.

LIMESTONE-CEMENT.

Riverside County.

The cement plant of the Riverside Portland Cement Company was under steady operation during the year.

San Bernardino County.

Baxter lime quarry, at Baxter Station on the Salt Lake Railroad, was under lease to the Sugar Lime Rock Company, 522 Pacific Electric Building, Los Angeles, California, and a certain tonnage of lime rock was shipped to sugar beet factories during the year. The quarry was not operated steadily.

California Portland Cement Company, offices 401 American Bank Building. The company's plant at Colton was under steady operation during the year.

The Southwestern Portland Cement Company's plant at Oro Grande was a steady producer.

MAGNESITE.

No magnesite was produced from the Bissell deposit during 1919. Owner, International Magnesite Company, Pasadena, California.

International Magnesite Company's plant at Chula Vista, San Diego County, recently resumed operations. Treating ore from San Margarita Island, Mexico.

MANGANESE.

The Black Jack Manganese mine and Bray Manganese mine, situated in the McCoy Mountains, twelve miles from Mineral Station, northwest of Blythe, Riverside County, were under operation until July, 1919, when operations were suspended on account of low prices for manganese ores.

Some manganese ore was shipped in 1919 from a deposit near Palm-dale, owned by the Llewellyn Iron Works. The ore was used in the company's plant at Terrance, California.

POTASH.

The American Trona Corporation's plant at Trona on Searles Lake was completed during the year, and was under steady operation most of the time, being a large producer of potash salts.

Another plant on Searles Lake was operated by the Boro-Solvay Company.

Outlook for Potash Industry.

The Potash Salts Bill, providing for licensing control of imports of potash salts in the interests of potash salts producers, will, if passed by Congress, be a help to the California producers of potash.

If the German and Alsatian supplies of potash are allowed to come in free of duty, it will be a means of killing the potash industry of the state.

There is also a large possibility that Europe will need all the potash that Germany and Alsace can supply for the next two years. This will give a chance for the American concerns to establish themselves on a producing basis to supply this country's needs, and help enable them to cut their costs of production so as to compete with the foreign producers of potash salts.

PUMICE.

The only production of pumice was made by Brand and Stevens of Los Angeles from a deposit near Calipatria, Imperial County.

QUICKSILVER.

The Cuddeback quicksilver mine, near Tehachapi, Kern County, was a producer during 1919. The ore being treated in a 12-pipe retort.

Property is operated by leasers.

LEAD, SILVER AND ZINC.**Inyo County.**

Cerro Gordo mine, the largest producer of lead-zinc ores in the state, suspended operations during the early part of 1919, on account of the low prices for lead and zinc, and increased cost of labor and material.

The Darwin Development Company are doing some development work on the Lane and Lucky Jim mines in the Darwin Mining District; 50-ton concentration plant.

The Tecopa Consolidated Mining Company have resumed operations on the Gunsite, Noonday and Grant mines in the Tecopa District; 100-ton concentration plant on the Gunsite mine.

San Bernardino County.

Bonanza King mine, situated in the Trojan Mining District was purchased by Hall, Rowster & Company, Acton, Massachusetts. Active underground development operations are being prosecuted under the supervision of Roscoe Miller, superintendent. Reported that approximately 15,000 tons of milling ore have been developed. Allis-Chalmers ball mill and floatation plant has been installed for treatment of ore. K. & K. flotation machines are to be used. Fifty men are employed.

The Avawatz Crown mine, Silver Lake District, has been reopened by Alvin B. Carpenter and associates of Los Angeles. Shaft has been sunk to a depth of 325 feet, and crosscut driven on 300-foot level, and the brecciated quartzite zone was cut for a distance of 200 feet. This entire zone was found to be mineralized with silver bearing galena, averaging 4 ounces silver and 9 per cent lead. Hoisting machinery and compressor are being installed on the property, and an intensive development campaign is planned.

Calico Mining District. Due to the high price of silver, prospecting is active in this old silver camp. Lane and associates are shipping ore from the district.

In the Rand Mining District near Randsburg, the Rand Divide mine was opened up by John W. Kelly and associates of Bakersfield. Rich silver ore was discovered on the surface and a shaft was put down on the discovery, which developed high grade ore, 15 feet in width. Approximately \$150,000 worth of ore has been shipped from the property. The average of shipments made ran about 50 ounces silver with gold values.

The ore occurs in a brecciated quartzite.

Outlook for the Future.

Due to the high price of silver the prospects are very bright for increased activity in the mining of silver ores.

The possibilities appear bright for the revival of some of the old silver camps in this district, which have been large producers in the past.

SILICA.

Riverside County.

A number of silica deposits are being worked in the vicinity of Lakeview. The principal shipper is the American Encaustic Tile Company, who have opened a large deposit near Nuevo, and are shipping a large tonnage to the company's plant in Los Angeles.

The Rainbow Mining and Mineral Products Company of Elsinore, California, are developing a deposit near Murrietta.

SODA.

Inyo County.

Several plants are in active operation on Owens Lake in the production of soda.

The California Alkali Company, at Cartago, is operating its 100-ton plant to capacity. One hundred men are employed.

Natural Soda Products Company, near Keeler, are producing about 30 tons of soda per day.

San Luis Obispo County.

Consolidated Chemical Company, Soda Lake, Carrizo Plain, was a producer of sodium sulphates during 1918, but owing to litigation the property has been idle during 1919. During 1918 shipments were made to the Torrance Glass Works, at Torrance, California.

STONE INDUSTRY.

Due to the outlook for a revival of building operations during the coming year, there should be an increased production of crushed rock. A number of plants are in operation in the vicinity of Los Angeles, the principal producer being the Pacific Rock and Gravel Company, who have two plants under operation near Azusa, California.

Riverside County.

The Temescal Rock Company operated the Temescal quarry four miles southeast of Corona, on a small scale during 1919.

TALC.

The largest producer of tale during the year was the Acme Tale mine, located seven miles east of Acme station on the Tonopah and Tidewater Railroad. Forty tons of material is being mined and shipped

per day to the Pacific Minerals and Chemical Company's plant at West Glendale, California.

The Amos Brothers of San Bernardino are large shippers of tale from a deposit located in the Silver Lake Mining District.

San Diego.

Otaylite Products Company, Los Angeles, have purchased a deposit of tale situated six miles southeast of San Diego on the Jamul ranch, near Otay.

The company is planning to develop the deposit, and put in a grinding plant. M. A. Hamburger, president, and E. H. McCullough, secretary, of Los Angeles, are the officers of the company.

TUNGSTEN.

The tungsten mines of Inyo and San Bernardino counties suspended operations during the latter part of 1918, due to drop in prices and small demand for tungsten.

The bill before Congress to put a duty on imports of tungsten concentrates should be of some help to the producers.

Labor Situation.

Due to the scarcity and high prices of labor the mining operators are working their properties with difficulty, and the present outlook is not encouraging for an abundant supply of labor.

Tariff Protection.

With a tariff placed on imports of magnesite, potash, quicksilver and tungsten great assistance would be rendered to the producers of these materials.

PETROLEUM.

The dependence of the industries of the Pacific slope upon California petroleum lends importance to a survey of the conditions affecting the oil business.

The total oil production in California during the year 1919 amounted to about 100,000,000 barrels, according to preliminary estimates by R. P. McLaughlin of the California State Mining Bureau. The final figure will probably show that the year's output was slightly more than that of the year 1918.

The total value of crude oil at the wells was about \$133,000,000, which is some five or six millions greater than the total value of the preceding year.

The field price of crude California oil has advanced during the last six years in almost exact accordance with the price of farm products, with the exception that in 1914 and 1915 oil was relatively cheaper.

Farm products during those two years advanced slightly, while oil suffered a marked decline.

The price of California fuel oil, at tidewater, has advanced less, proportionately, than has the field price of crude oil. The present margin between the field price of 24° Baume crude and that of fuel oil, at tidewater, is 25 cents, the same as during 1916. The price of California oil may not, therefore, be reasonably expected to decline until the general price level of all commodities falls.

On the other hand, it should be noted that oil is still cheaper than coal, which sells for about \$8 per ton on Puget Sound, as against \$6.47 for an equivalent amount of oil (3½ barrels) at the same point of delivery. Further advance in the price of oil might, therefore, appear reasonable.

The increase or decrease of the amount of oil in storage has for several years been generally considered an index for field prices. During the past year and a half, however, the effect of stored oil on field prices has been entirely obliterated or neutralized by the general condition of advancing prices of all commodities.

Current statistics by private concerns disagree as to the actual amount of oil now stored, but do agree in indicating that stocks were somewhat less at the end of the year 1919 than at the beginning. Such a condition, in conjunction with the fact that total production was approximately the same as during the previous year, shows that the industry has not quite held its own.

The effort to maintain the status referred to involved the addition of some 500 new producing wells, in order to offset the natural decline of productiveness of old wells. The daily rate of production per well declined during the year from 32 barrels to 30½ barrels. The rate of decline has been fairly constant since 1916, when the average well was producing 37 barrels of oil per day.

The acreage of proved oil land was materially increased during the year 1919 by developments in the Elk Hills, in Kern County, and in the Richfield field, in Orange County. The total proved oil land is now probably more than 91,000 acres, as compared with 89,212 acres in March, 1919.

The development of a very great supply of gas in the Elk Hills will doubtless greatly benefit neighboring cities in the San Joaquin Valley. This development was the direct outcome of recommendations based on engineering investigation by the State Mining Bureau.

The Elk Hills region constitutes a major portion of Naval Petroleum Reserve Number One, which has long been the subject of discussion before Congress and of litigation in the federal courts. A recent decision of the Supreme Court cancelled patents of the Southern Pacific

Company to some 6000 acres of land, having a value of probably eight or ten million dollars. That the United States Navy should have a large and certain supply of oil on the Pacific Coast can not be doubted. Two reserves of oil land have been established, but the government does not hold clear title to much of the land. Recent developments in Reserve Number One demonstrates its value as an oil producer, and it probably also contains a large amount of land, title to which may be determined to have never passed from the government. The total area of the reserve is about 37,600 acres, about 25,700 acres being unpatented and subject to future determination of title. The recent court decision, covering about 6000 acres, apparently definitely returns title to the government. Patented lands in the reserve amount to about 5900 acres, of which the Southern Pacific Company holds about 4600 acres.

The greatest event of the year, in determining title to oil land, was the decision of the United States District Court in the consolidated cases of the government against the Southern Pacific Company, involving 161,267 acres, of which about 18,000 acres may be classed as proved oil land, having a value of possibly \$36,000,000. The decision was in favor of the company, and press reports quote the Attorney General as saying that no appeal will be taken. Suit was commenced in December, 1912.

An important effect of the termination of the Southern Pacific suit would seem to be an increased supply of oil to meet the varied demands of industry. Development of the railroad land, during the time of litigation, was retarded to such an extent that the railroad company annually purchased some four or five million barrels of oil from other producers. The probable productivity of the land seems to indicate that the present number of productive wells can be at least trebled.

Construction of additional hydroelectric power plants is reported as going forward to such an extent that the present annual consumption of oil, for generating electricity, will be reduced by about 2,000,000 barrels. The present consumption of oil, for various industrial purposes, can be still further reduced by utilizing many well known sources of water power.

Proposed federal legislation providing for the leasing of government owned oil lands has progressed far enough to show about what lines it will pursue. The final enactment of such legislation would indicate that development would proceed on a considerable area of proved oil land, resulting in increased oil production. Such an effect will probably not be instantaneous, as there are doubtless some claimants to land who will prefer to proceed with legal actions under the belief that they can obtain clear title to land rather than a lease. Most of the proved

oil land affected by proposed legislation is probably covered by the claims which will be given preference in the issuance of leases. The existence of such preferred claims is a factor of importance to many oil operators outside of California, who have anticipated commencing operations here as soon as governmental leasing becomes effective.

Waste of oil, and damage to the natural deposits through improper production methods, has decreased under state supervision. The details of state supervision have been so developed and systematized that the regularly published monthly reports of the State Oil and Gas Supervisor briefly and clearly show the relative efficiency of all important producers.

The burning of crude oil, without first extracting its more valuable constituents by refining, is an economic waste which is apparently being eliminated. During the past year about 80 per cent of the total oil production passed through refineries, as against only 60 per cent two years earlier. The average yield of refined products from a barrel of oil was about 5 gallons of gasoline, $2\frac{1}{2}$ gallons of kerosene, $\frac{3}{4}$ gallon of lubricants, 4 pounds asphaltum, and 28 gallons of fuel oil.

Stocks of refined products, as reported by the United States Bureau of Mines, during the first nine months of the year, showed considerable variation. Gasoline stock was the only one to decline, the September figure being 20,183,511 gallons as compared with 35,579,288 gallons in January; kerosene increased from 13,085,166 gallons to 21,549,590 gallons; lubricants increased from 8,630,730 gallons to 14,175,482 gallons, and asphalt increased from 8847 tons to 10,542 tons.

Consideration of the foregoing facts indicates an encouraging outlook for the coming year. Production from proved lands should continue with profit to producers as well as the industries dependent upon oil. It is almost an assured fact that all the oil deposits of the state have not yet been discovered, and further prospecting under the guidance of thoroughly qualified geologists should be profitable.

ESTIMATED CALIFORNIA MINERAL PRODUCTION IN 1919.

By WALTER W. BRADLEY, *Statistician and Curator.*

The statistical division of the State Mining Bureau estimates the mineral production of California for the year 1919 at a total value of approximately \$182,463,000. This is a conservative figure, and includes all products, metallic and nonmetallic, being in advance of the actual figures which will be available later when the complete returns are received from the various producers. This is a decrease of approximately \$17,000,000 compared with the 1918 total, and is due to the marked drop in prices and the cessation in demand of the so-called "war minerals."

Individually, increases were made by petroleum and gold. The former, while increasing but slightly in total number of barrels, showed an increase of about \$6,000,000 in value. Gold increased approximately \$800,000 in value, indicating that this form of mining in California is already beginning to readjust itself. However, this recovery from the downward trend of the preceding three years and particularly from the abnormal drop in the 1918 output, is the result of improved grades of ore in some of the larger lode mines, rather than from the reopening of old properties.

Notable decreases in value are shown by: copper, approximately \$7,600,000; potash, \$6,000,000; tungsten, \$2,770,000; quicksilver, \$1,200,000; and by chromite, lead, manganese, and zinc. Dropping from the record figures attained in the period 1916-1918, the production of chromite, potash, and of tungsten became practically nil in 1919. Shipments of manganese ores amounted to only about 50 per cent of the 1918 output.

The date of publication of the final and complete report on the mineral production for the year is dependent upon the promptness of the replies from the operators. The law requires that reports must be made to the State Mining Bureau, the details of the individual returns being held confidential.

The estimated quantities and values for 1919 are tabulated as follows:

	Quantity	Value
Gold		\$17,320,000
Silver	1,121,400 ounces	1,244,000
Tungsten concentrates	100 tons	60,000
Copper	22,800,000 pounds	4,237,000
Lead	4,450,000 pounds	254,000
Zinc	970,000 pounds	69,000
Quicksilver	15,000 flasks	1,300,000
Platinum	500 ounces	60,000
Petroleum	100,000,000 barrels	133,000,000
Chromite	1,500 tons	39,000
Manganese	11,000 tons	225,000
Magnesite	60,000 tons	480,000
Natural gas	47,000,000 M. c. ft.	3,500,000
Brick, cement, building stone, crushed rock, etc.		13,550,000
Miscellaneous "industrial" minerals		2,000,000
Salines (including borax, potash, salt, soda)		5,130,000
Total		\$182,463,000

THE ANNUAL REPORT

OF THE

Commission of Immigration and Housing of California

JANUARY, 1921



CALIFORNIA STATE PRINTING OFFICE
J. M. CREMIN, Superintendent
SACRAMENTO, 1921

PERSONNEL OF THE COMMISSION.

COMMISSIONERS.

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MOST REV. EDWARD J. HANNA, D.D., *Vice President*-----San Francisco
MRS. FRANK A. GIBSON-----Los Angeles
J. H. McBRIDE, M.D.-----Pasadena
PAUL SCHARRENBURG, *Secretary*-----San Francisco
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Fresno—

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Sacramento—

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Stockton—

Council Chambers, City Hall.

Bakersfield—

Arlington Building.

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LETTER OF TRANSMITTAL.

To His Excellency, WILLIAM D. STEPHENS,
Governor of California.

SIR: We have the honor to submit herewith the annual report of the Commission covering its operations during the year 1920.

To your interest and assistance in the work of housing, camp sanitation and Americanization, the Commission owes much of the success with which it has met.

Respectfully yours,

COMMISSION OF IMMIGRATION AND HOUSING OF CALIFORNIA

JANUARY 3, 1921.



INTRODUCTION.

The following are a few of the vital principles upon which the Commission of Immigration and Housing was founded and upon which the work of that Commission is based. The years of experience in the work which touches the foreign-born have merely strengthened the Commission's belief in the soundness of these principles.

Motive Underlying the Creation of the Commission.

The motive underlying the creation of the Commission was not a paternalistic one. Nor was the Commission an institution created through the feeling of favoritism to the immigrant. Its creation was governed merely by a desire to overcome the handicaps under which the immigrant lives, putting him into a position not superior, but merely equal to that of the native born, which is only fair and just to the newcomer.

The Working Scheme.

At the time of the creation of the Commission there were many existing agencies in the state ready to help the immigrant. But they needed direction, coordination, and a great deal of energizing and inspiring. With the thought in mind of acting as such a coordinating agency, the Commission was established as an independent, separate organization, linked with no other body in the state.

"Going Out for Business."

The Commission from the beginning, was not content merely to wait until tasks were imposed upon it. A policy of "going out for business" was the point of departure, and it has brought rich results in that almost at once it won its place among the foreign-born of the state.

The Bureau of Complaints.

"Not to speculate concerning the problems met with by our immigrants, but to find out, from the immigrants themselves what those problems are." The Commission, at the start, consulted all the literature available on the subject of immigration, but had to adopt the above motto in order to find a definite starting point. So the Bureau of Complaints was organized, and its work has fallen into three divisions. First it functions as a clinic, to receive and diagnose any given problem; then it adjusts the particular complaint either directly or through a cooperating agency; and finally it seeks to remedy the difficulty which lies at the root of the complaint by striving for improved legislation, and by educating public opinion.

Why Housing Was Included.

At first there was opposition to combining immigration with housing. Then a woman, a member of the preliminary committee, broke through with her statement, "The home is the basis of civilization in all lands. The house is the concrete aspect of the home. The house, generally overcrowded and in the slums, is the first point of contact between the immigrant and his new environment. And no culture can be fostered in a miserable hovel, but ignorance, vice and crime thrive therein." So the combination was made.

No New Problems.

A careful study of the records of the complaint bureaus brought out the fact that the immigrant has and presents no new problems, but merely intensifies aspects of problems already existing, involving housing, urban and rural, court and police dishonesty, illiteracy and education, recreation and use of leisure time, etc. The first step in dealing with the immigrant, then, was not to devise new *laws* which should be different from the laws governing the native-born, but to set about removing the handicaps which made *him* different from that native-born, so that he might take his rightful place beside him.

Removing Handicaps.

The removing of the handicaps which hold back the immigrant serves a double purpose. It gives to that immigrant the chance to work his way toward a contented life here. It also saves our country from the "menace of the immigrant," so feared by many who now oppose immigration. This is shown in the Commission's work in labor camps where chiefly immigrants are employed and which were veritable breeding places of disease before the campaign of improvement was begun.

The Right Mental Attitude.

The first public appeal of the Commission was not to the immigrant, but to the native-born who were asked to assume towards the new-comer the right mental attitude, for the stranger in great part reflects the environment in which he finds himself. Antagonism, suspicion, the spirit of rebellion, on the part of the immigrant, are all, very often, but the normal reactions called forth by the treatment which he receives from his hosts.

The Domestic Policy.

The problem of the domestic policy is the problem of such attitude. Nor should that policy be influenced too greatly by the national immigration policy, for the two can be entirely distinct. That is, the national policy might suddenly become that of prohibition of immigration, but that would make no difference in the domestic policy, for the immigrants

already here would have to be handled exactly in the same manner as formerly.

Regulating Immigration.

The domestic policy is a better means for determining the quality of immigration than any restrictions at the gate. Practically all the immigrants come here in response to letters from friends already here. If the things to be found here are fine, then fine people from abroad will respond to the quest for them. If, on the other hand, the letters home bear tales of fraud and deception, practiced upon the immigrant, then the lawless element from the native land will come in the hope of an easy existence.

"Scatter the Immigrants."

The plan of scattering the immigrants has often been offered as a panacea for all problems of immigration. The study of the question, however, has revealed that distribution from behind does no good. The only acceptable kind of distribution is through making a given place so attractive that a man has to come there. "If you would have him go to the farm, you must make the farm more attractive to him and to his children." This statement coming from an immigrant was not idly made.

National Heritages.

Realizing the valuable contributions that have been made to the world's civilization by all the nations, the Commission has sought to encourage the preservation and development of the best national cultural elements, in art, literature, music, science, the crafts, and in things spiritual. Only by preserving and developing these heritages and combining them with the cultural elements which are distinctly American can the foreign-born be given their rightful place in the tasks of our nation.

Rational Assimilation.

From the first the Commission took its stand against that form of assimilation which hands to the immigrant some things which he is supposed to swallow. So, while emphasizing the things we must give the alien, it has placed equal emphasis upon the things he can give us. This conception makes a natural place for the immigrant in America, by making him welcome, by giving him a share in the common tasks, and by educating him properly, basing that education upon things already known to him.

Immigrant Education.

It is upon this plan of working from the known to the unknown that the entire scheme of immigrant education should be built. And this con-

ception ties education very closely to daily life. The classes for immigrants which have been organized with the cooperation of the Commission are held at the time and in places most convenient to the people who are to be instructed and the subject matter for the lessons is chosen with a view toward the greatest benefit to them. Also, the Commission has used its influence to establish classes for teachers of immigrant education, believing that, oftentimes, the greatest difficulty connected with the problem lies with the teachers who are not properly trained for the work.

Americanization.

The Commission found that Americanization was not flag-raising and "patriotic" howling; that it was not suppression of speech and honest opinion; that it was more than teaching English to foreigners. Americanization, it found, is the encouragement to decent living and making possible the attainment of decent standards. It involves the development of national ideals and standards and the schooling of all residents, foreign-born as well as native-born, in those ideals and standards.

Community Organization.

The best medium for this development of national ideals and standards is, of course, the community. It is in his life as a member of the community that every man, native-born or foreign-born, becomes truly Americanized and makes his best contribution to his nation. Therefore the Commission is definitely interested in the development of all rational schemes of community organization.

Finally—Our Apology.

As a sovereign nation, we have the indubitable right to admit to our shores those whom we desire and to exclude any and all if we choose. But, once admitting a man either for sentimental reasons or because we believe he will prove of economic benefit to us, we have taken on an obligation to treat him decently, to protect him from exploitation and abuse, and to do all those things that tend to remove his peculiar handicaps and that tend to give him an equal opportunity with his neighbor. To give expression to this theory, the Commission of Immigration and Housing was formed.

But, also, the experience of the Commission has shown that a unique opportunity is at hand to build here, consciously and deliberately, a new nation that shall embody the best of all national cultures, ancient and modern, giving to it the advantages which no other nation can enjoy.

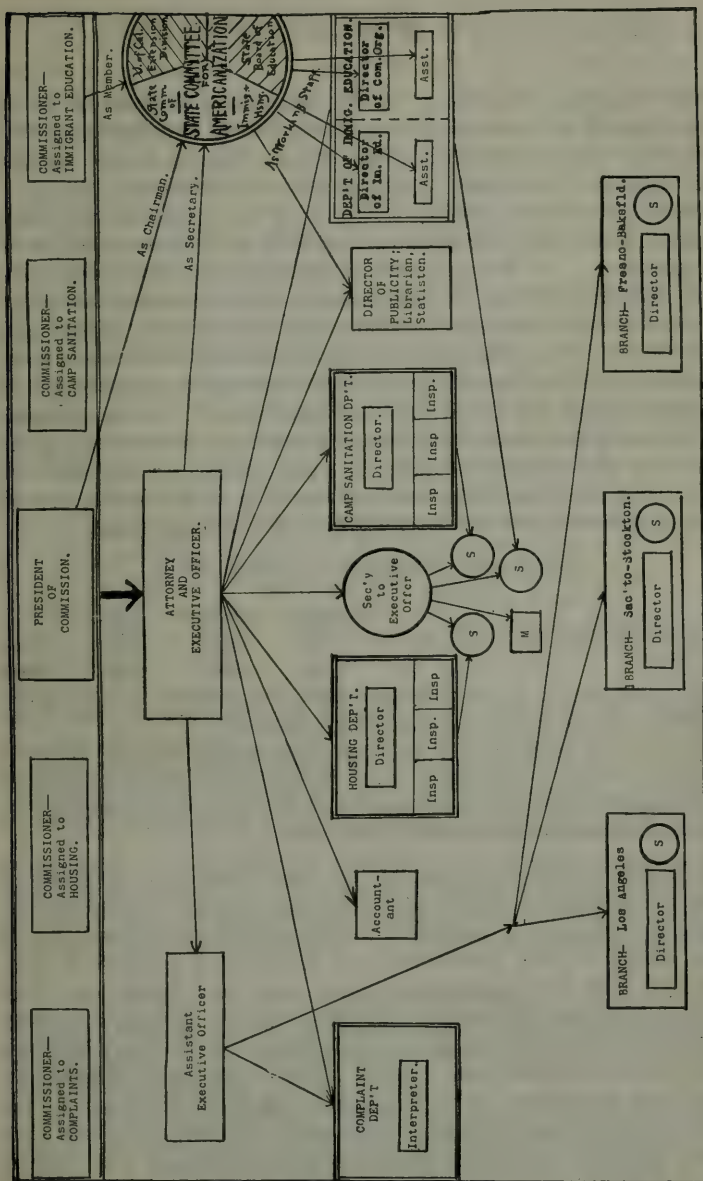


Chart Showing Administrative Organization of the Work of the Commission of Immigration and Housing of California.

REPORT OF THE COMPLAINT DEPARTMENT.

The Complaint Department of the Commission is designed, as its name suggests, to receive and adjust complaints of immigrants who are in trouble. Its methods have become standardized to a point where a large volume of work can be, and is, efficiently handled.

When a request for assistance is made by an immigrant his case is classified according to an arbitrary standard, as a "Complaint" or an "Application." If the statement of the immigrant shows that some other individual, official, or corporation is directly involved, such person or corporation is named as defendant, and the case is filed as a "Complaint." If no other person is directly involved and the case is one which requires only the giving of information, advice or assistance of a general nature, it is classified as an "Application." An investigation of the case is then made and appropriate advice or assistance is given. Complaint Department Table No. 1, which appears on this page, indicates that the Commission has been handling an average number of between 4000 and 5000 complaints and applications each year.

COMPLAINT DEPARTMENT—TABLE NO. 1.

Summary for 1914 to 1921.

	Complaints	Applications	Totals	
January 20, 1914, to January 1, 1920.....	15,263	10,418*	25,686	
January 1, 1920, to January 1, 1921.....	2,125	2,214	4,339	(5260)†
	17,398	12,632	30,025	(30946)†

*During the first year of the Commission's existence no distinction was made between "Complaints" and "Applications." During the period from July 1, 1918, to January 1, 1921, "Complaints" and "Applications" have been classified separately.

†Prior to January 1, 1920, all complaints and applications regarding labor camp and housing conditions were first classified in the Complaint Department records and were then assigned to the proper department for investigation. During 1920 they have been referred directly to the Department of Camp Sanitation and the Department of Housing. Nine hundred twenty-one of such complaints and applications have been received during the year. It is apparent, therefore, that under the old system of tabulation the total for the year should be increased to 5,260; and the grand total should be made to read 30,946.

It would be absurd to suggest that the foreign-born applicant is always in the right. In 175 cases the complaints were dismissed after thorough investigations because it was apparent that the complainants were wrong in their contentions. In a very few instances it even appeared that the complainants knew they were wrong and were attempting to take advantage of someone else. In the great majority of cases, however, a just cause of complaint existed. In many instances where such settlements were effected, property recovered, or assistance given, this department of the Commission provided an agency for the actual administration of justice which would otherwise have been completely lacking. In those instances in which adjustments were secured of cases which would otherwise have been taken to court, the Commission was able to save to the state many thousands of dollars. It has

been estimated that the expense to the state involved in a jury trial in the superior court is about \$200 per day. When it is considered that many of these cases extend over periods of three or more days it is possible to estimate the tremendous financial burden which is being avoided through the work which is being done for these immigrants. The Commission's work also emphasizes the need of legislation to provide for similar processes of conciliation in cases in which others than immigrants are involved. Such legislation has been in effect in other countries for some time, with the result that the work of the courts and consequently the need of court buildings, judges, juries and other court officers have been tremendously decreased.

The main office of the Complaint Department is located at San Francisco in the most cosmopolitan section of the state. The others are placed at convenient centers of labor and foreign population, namely, at Los Angeles, Sacramento, Stockton, Fresno and Bakersfield. In order to increase the work of the department to the point of greatest efficiency, another office should be established in the foreign section of San Francisco, one in Oakland, and probably other offices in San Diego, San Jose and Eureka. Even then it can readily be seen that some deserving persons would not be reached. Wherever an immigrant lives there is a possibility for work by this department. Where the amount in dispute is small, the issue involved relatively unimportant, or the complainant is very poor, of course he cannot travel far for aid. Some cases of this kind can be cared for by mail, but the Commission must expect to secure results in a good many of such cases by cooperation with the local officers, the Legal Aid Society, or the local charities. There is a large field for cooperation in this direction and the Commission will welcome suggestions as to how it can best help to meet the problem of the rural districts.

In a great many cases the Complaint Department was able to bring into contact with other officials and commissions, immigrants who would otherwise have been unable to take advantage of the methods of law enforcement provided by the state and intended to regulate special classes of cases. The Industrial Accident Commission and the State Bureau of Labor Statistics are the two most important instances of this kind.

In several instances the Commission has through its agents in the Complaint Department and the Department of Camp Sanitation avoided incipient labor troubles and has settled troubles already precipitated in which immigrant workers were involved.

One of the most marked single achievements of the Complaint Department of the Commission is to be found in the present investigation and revelation of the miscarriage of justice which has prevailed in the

police courts of San Francisco. This investigation was directly precipitated by the activities of the Commission's representatives in connection with various cases of the exploitation of immigrants which arose in connection with those courts. It is to be hoped that out of this and other investigations of the same kind may come substantial improvement in the method of administration of justice in the lower courts. Until we have taken steps to remove the procedural delays, crooked practices, and disregard for law which have grown up around some of our courts, we cannot expect to merit the respect of our people or of the immigrants. The Commission believes in the extension of Legal Aid Societies of the type which it has helped to develop in San Francisco. It urges the creation of the office of public defender at least in the larger counties. There can be no doubt that the presence of many undesirable features of police court work, including the shyster lawyers, can be largely eliminated through the presence of the public defender.

The Commission urges intelligent revision of the laws relating to the selection and service of juries, and the preservation of the right of jury trial. Unwarranted delay and inexcusable abuse of the jury system are possible under our present laws.

Thousands of immigrants each year are making their acquaintance with the American judicial system through the medium of our lower courts, and we should insist that there be given in those courts an administration of justice, just as intelligent just as fair and just as dignified as in the higher courts. Certainly the guarantees of our government will sanction nothing less.

In conclusion it must be said that the files of the Complaint Department contain a record at once weird and pathetic, of the penalty paid by the immigrant by reason of his ignorance and misplaced confidence. So long as we have immigrants we may expect to have need of a strong governmental agency to protect them.

COMPLAINT DEPARTMENT—TABLE NO. 2.

Causes of Complaints, January 1, 1920, to January 1, 1921.

Abuse and threats.....	15	Crimes:	
Accounts and debts.....	44	Aged parent, neglect of.....	1
Attachments.....	5	Battery.....	17
Baggage:		Blackmail.....	2
Damaged.....	1	Contribution to delinquency.....	4
Lost.....	72	Children:	
Blacklisting.....	1	Cruelty to.....	2
Check and money order, trouble over	44	Failure to provide for.....	2
Children:		Neglect of.....	1
Attendance at school.....	2	Duress.....	22
Delinquents.....	2	Embezzlement.....	13
Collection Agency.....	1	Extortion.....	3
Contracts:		Libel and slander.....	2
Breach of.....	295	Homicide.....	1
Partnerships.....	8	Malicious mischief.....	7
Void.....	1	Malicious prosecution.....	8

COMPLAINT DEPARTMENT—TABLE NO. 2—Continued.

Obtaining money or property by false pretense.....	32	Landlord	15
Perjury, subornation of.....	3	Marital and domestic troubles:	
Postal laws, violation of.....	4	Breach of promise.....	1
Prostitution	1	Common law marriage.....	3
Robberies and thefts.....	16	Desertion and non-support.....	46
Seduction	1	Divorce	5
Deportation	3	Parent and child.....	16
Discrimination	7	General	27
Ejections and Evictions.....	18	Naturalization	1
Failure to pay judgment.....	6	Officials:	
Fraud and neglect:		Abuse of authority.....	39
Attorney's	49	Neglect of duty.....	36
Business	93	Overcharge	16
Dentist's	1	Passport	14
Doctor's	1	Personal injuries:	
Employment:		Motor vehicles.....	43
Agency	67	General	28
Private	16	Property:	
Hotel and lodging house.....	5	Conveyances, deeds, mortgages,	
Insurance	5	leases	4
Interpreter's	3	Detention of.....	90
Land	10	Destruction of.....	4
Stock sales	4	Injury to.....	5
Tickets	5	Loss of.....	12
Trustee's	1	Taxes	4
General	9	Transportation trouble.....	20
Hospital	8	Unions	4
Immigration	4	Wage claims.....	548
Industrial accidents.....	158	Total	2125
Industrial compensation, trouble over	38		

COMPLAINT DEPARTMENT—TABLE No. 3.

Disposition of Complaints, January 1, 1920, to January 1, 1921.

Advice given:		Industrial accidents:	
1. Business	1	1. Adjustment made.....	7
2. Legal	154	2. Assistance given.....	30
3. Miscellaneous	13	3. Referred to Industrial Accident Commission.....	87
Assistance given:		Property recovered.....	66
1. Criminal cases:		Referred to:	
a. Parole secured.....	2	1. Attorneys	82
b. Release from detention.....	7	2. Charities	2
c. Warrant obtained.....	1	3. Health authorities.....	1
2. Civil cases:		4. District attorney.....	22
a. Attachment release.....	1	5. Immigration Commission United States	6
b. Ejectment stayed.....	12	6. Industrial Welfare Commission.....	1
c. Judgment procured or collected.....	1	7. Insurance Commission.....	1
3. Hospital or medical aid secured.....	2	8. Justice of the Peace.....	4
4. Miscellaneous:		9. Legal Aid Society.....	1
a. Money orders cashed.....	21	10. Official of private company.....	1
b. School attendance secured.....	1	11. Police department.....	5
c. General	13	12. Probation officers.....	2
Business disagreement adjusted:		13. Public defender.....	13
1. Contract adjusted.....	76	14. Shipping commissioner.....	1
(including debts, accounts, tenancy, etc.)		15. Postal authorities, United States	6
2. Money settlement secured.....	176	16. Juvenile authorities.....	5
Complaint dismissed:		17. Other officials.....	7
1. Dropped by complainant.....	93	Tax difficulty adjusted.....	4
2. Insufficient evidence.....	50	Wage and labor disputes:	
3. Complaint unfounded.....	175	1. Collections made.....	165
4. Statute of limitations run.....	4	2. Assistance given.....	29
Defendant not found.....	7	3. Referred to Labor Bureau.....	203
Defendant warned	26	Total	1630
Defendant disappeared	3	Number complaints pending.....	495
Defendant died.....	1	Total	2125
Domestic difficulties adjusted.....	38		

COMPLAINT DEPARTMENT—TABLE NO. 4.

Nationalities of Complainants, January 1, 1920, to January 1, 1921.

African	4	Irish	10
American, South	4	Italian	185
American, Central	13	Jugo-Slav	6
Armenian	27	Let	5
Australian	2	Lithuanian	6
Austrian	21	Mexican	1022
Bohemian	1	Montenegrin	2
British	11	Persian (Afghan)	2
Eulgarian	3	Polish	14
Canadian	7	Portuguese	42
Chinese	1	Roumanian	5
Croatian	7	Russian	322
Czecho-Slovak	14	Scotch	2
Dalmatian	1	Serbian	5
Danish	4	Slavonian	5
Dutch and Flemish	1	Spanish	120
Filipino	10	Swedish	13
Finn	2	Swiss	14
French	24	Turkish	1
German	42	Yiddish	8
Greek	65	Nationality unknown	42
Hawaiian	10		
Hindu	9		
Hungarian	11	Total	2125

COMPLAINT DEPARTMENT—TABLE NO. 5.

Status of Citizenship of Complainants, January 1, 1920, to January 1, 1921.

Aliens	2044
Citizens	137
Declarants	123
Unknown	145
Total	2125

DEPARTMENT OF LABOR CAMP SANITATION.

During the past ten years California has witnessed a complete transformation in the living conditions of her migratory laborers. An even more striking change has transpired during the last three or four years in the attitude of employers and the general public regarding labor camps.

Prior to the passage of the Camp Sanitation Act in 1913, the labor camp, except in established year-round occupations, was almost an unclassified object. Large crowds of people were brought together indiscriminately to pick hops or prunes or work in the cannery or packing house, and the fact of their being together was an incident largely unconsidered in the season's program. Today it is one of the most important considerations in the minds of the employer of labor. Ten years ago the conditions prevailing in labor camps made them the breeding ground for I. W. W. 'ism and similar outbursts. Today radical labor movements have been practically eliminated in the field of industry served by transient labor through the lessening of insanitary conditions which formerly provided a basis for "red" propaganda.

Employers of labor have little by little come to realize that money expended for better camps—in many cases model camps of permanent structure—is money well expended. It is an investment in a stable, contented and efficient labor supply with a resulting increase in production, and safety of product.

California has the largest number of outdoor labor camps of any state in the Union. The number varies much from year to year and indeed from month to month; but many of the camps are permanent. The importance of these camps in the economic existence of the state may be judged by the following list of industries in which they occur:

Lumber and mill camps. --

Oil and mining camps.

Construction and railroad camps (including maintenance of way cars, etc.).

Fruit, berry and raisin camps.

Cannery and packing house camps.

Beet camps.

Ranch camps (including truck crops, walnuts, tobacco and scores of other branch industries).

Rice camps.

Cotton camps.

A very large percentage of the laborers who spend a part or all of their time in such camps are of foreign birth or parentage. It is from these camps that the unskilled immigrants, newly arrived in our state, obtain many of their impressions of the United States and its economic and governmental standards.

Since the year 1914 the Commission's camp inspectors have visited 7979 labor camps, scattered from one end of the state to the other. The accompanying chart will indicate the gradual improvement which has resulted.

The year 1920 has witnessed not only the continued improvement of camp conditions, but also vital changes in the system of operating them. Under the old established system it was the regular thing for each worker to carry his blankets from job to job. During the year of 1920 the Camp Department has succeeded in inducing many companies to provide their workers not only with the bunks or beds required by law, but also with the necessary bedding. Thus has been effected the beginning of the elimination of the "blanket stiff" or of blanket carrying by workers in labor camps.

Another change brought about in housing of seasonal workers has been the "community camp." This system of camp operation was begun in 1918 and has continued successfully with improved types of

structure. During the past year several modern camps have been constructed throughout the state.

To secure the best cooperation from camp operators, the Director and Inspectors of the Camp Department have held numerous meetings with groups of employers to explain the requirements of the camp law and matters pertaining to camp construction and operation. In most instances the desired results were obtained in this manner.

However, there have again been a few camp operators who do not or will not conform to the requirements of the law until compelled to do so. Therefore the inspectors have had to initiate criminal proceedings against several such operators. In every instance the Commission has secured a conviction. This indicates that the people of the state generally have been ready and willing to uphold the constructive work carried on by this department.

CAMP DEPARTMENT.

Report on Camp Reinspections from January 1, 1920 to January 1, 1921.

ORIGINAL.

Total number of camps inspected.....	2,022
Total population	73,458
Total number of good camps.....	670
Total number of fair camps.....	1,069
Total number of bad camps.....	283
Total	2,022

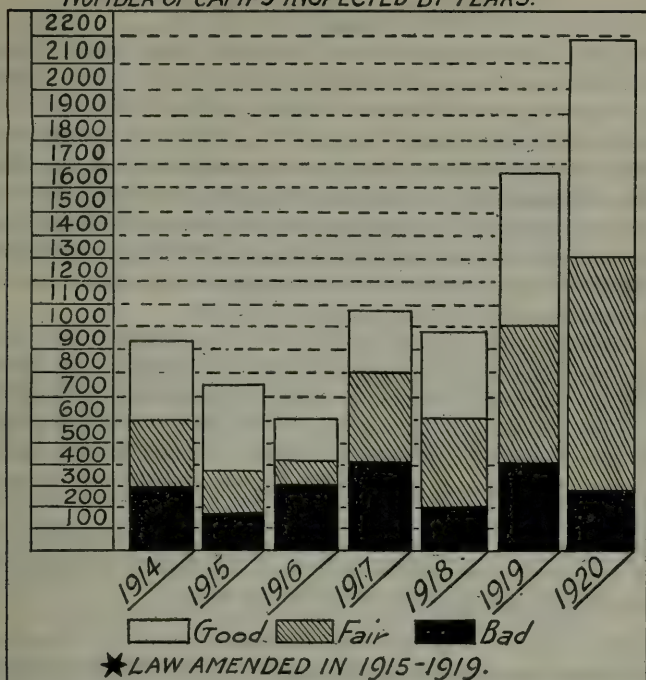
CAMP DEPARTMENT.

Report on Camp Reinspections from January 1, 1920, to January 1, 1921.

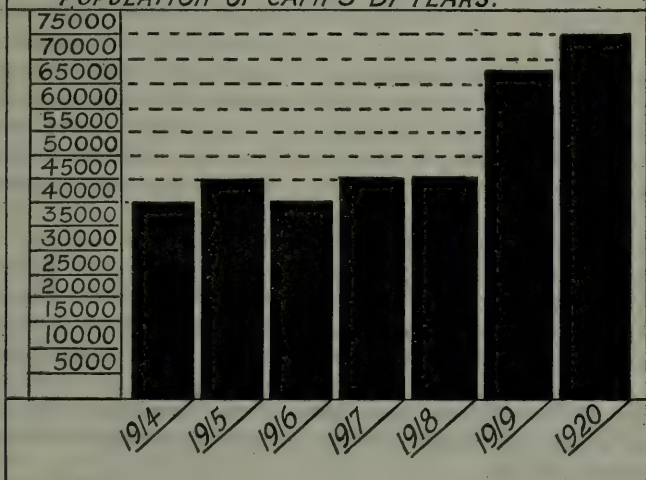
REINSPECTION.

Number of camps brought from bad to good on reinspection.....	6
Number of camps brought from bad to fair on reinspection.....	16
Number of camps showing no improvement on reinspection.....	16
Number of camps brought from fair to good on reinspection.....	41
Number of camps showing no improvement on reinspection.....	30
Number of camps that went from fair to bad on reinspection.....	6
Number of camps that went from good to bad on reinspection.....	0
Number of camps that went from good to fair on reinspection.....	4
Number of camps that were good on original inspection, where inspector recommended added facilities on reinspection all recommendations had been complied with.....	34
Total number of reinspections.....	153

NUMBER OF CAMPS INSPECTED BY YEARS.



POPULATION OF CAMPS BY YEARS.



HOUSING DEPARTMENT.

From every section of the State of California comes the cry for more houses—more housing accommodation—and the remedies suggested vary from tent cities and the use of public buildings to the closing of the doors of the state to transient population. While such remedies might produce a temporary but entirely inadequate relief from the present housing shortage, there is a growing demand for federal and state action to meet the situation in a broad and comprehensive manner that would assure the people of this state the minimum of housing accommodation necessary to meet the requirements of sanitation and safety established by law and recognized as an American standard.

A statement already submitted by the Commission at the request of Governor Stephens sets forth the causes of the present shortage of houses and suggests remedies to meet the situation. The problem daily becomes more and more serious, as the present building program of the state is not even meeting the normal required housing increase, to say nothing of making up the shortage, which developed during the war period.

While any program must be capable of constant adjustment in a period of rapid change, such as the present, the work of the department is proceeding in general along the following lines:

I. LAW ENFORCEMENT

(a) General and uniform enforcement of the state law. The shortage of houses, accompanied by high rents and the resulting use of every available habitation makes this work increasingly difficult. It is especially hard for the local officials, who are charged with the enforcement of the laws to secure compliance with regulations which in many instances demand reconstruction and alteration of buildings involving large investments. The Commission's main function in the field of law enforcement is that of inspection of housing conditions and advising local officials of those conditions. The housing acts contemplate that the work of law enforcement should be carried on by the local officials. They expressly provide that the Commission can take active charge of prosecutions only in case of failure, refusal or neglect of duty on the part of those directly charged with this work. The Commission has been able to secure an increasing degree of cooperation from the local officials in the enforcement of the laws. It has, of course, been necessary during this emergency period to use discretion in the exercise of the arbitrary power vested in the Commission. Any other course would have resulted in unnecessarily harassing these already embarrassed officials.

(b) Development of a uniform system of inspection, record keeping, reporting, etc., to be adopted by the cities of the state in order to facilitate more efficient inspection and lay the foundation for statistical information regarding the building activities in the municipalities of the state.

(c) Inspections in cooperation with local authorities with a view to assisting in the development of local housing, building and sanitation departments where such departments do not already exist or for various reasons they have been handicapped in their service.

(d) The interpretation of questions of law submitted by local officials and departments concerned with the work of law enforcement.

II. LEGISLATION.

(a) Study of present ordinances in municipalities relating to housing and assisting in the preparation of housing and building codes pertaining to dwelling houses, hotels and tenement houses which will properly supplement the minimum standards established by the state law.

(b) The holding of housing institutes in two or three centers of the state for discussion of the present housing acts by public officials and others directly concerned with housing legislation and to obtain from persons with first hand experience the information necessary for a satisfactory revision of the act. This work is being undertaken with the express sanction of Governor Stephens. It should result in substantial improvement of the existing laws, making such changes as experience has shown to be necessary to render their provisions most effective, and at the same time eliminating unnecessary restrictions which have perhaps contributed to the shortage.

(c) The holding of a series of conferences with men representing various lines of business and professional activity and the development therefrom of a proposed act to aid and encourage the construction of dwelling houses throughout the state. This proposal has been recently presented to Governor Stephens.

III. EDUCATIONAL WORK.

(a) The study of conditions in this and other states and of the experiments and solutions offered for housing problems in various parts of the world; the dissemination of the results of this study by lectures to various local and state organizations which are assisting in housing work.

(b) The development among city officials and others of an interest in housing, sanitation and city planning in general, as the most effective methods of safeguarding the homes and the existing realty values in the community.

THE DEPARTMENT OF IMMIGRATION EDUCATION.

During the latter part of the year 1919 a committee was appointed by Governor Stephens to take charge of the work of Americanization in California. The membership of this committee was made up as follows:

1. Simon J. Lubin, *Chairman*;
2. Mrs. Frank A. Gibson.

Both from the Commission of Immigration and Housing.

3. Will C. Wood, State Superintendent of Public Instruction.
4. E. P. Clarke, President of the State Board of Education.
5. Prof. F. T. Blanchard;
6. Prof. L. J. Richardson.

Both from the Extension Division of the University of California.

It was this committee which arranged and held a series of institutes throughout the state which were designed to prepare teachers for the instruction of immigrants. The institutes reached a large number of people and as a result about one thousand teachers were prepared and certificated. The instruction given was built up around the lecture work of Mr. John Collier, who was brought from New York by the University of California, and who was paid jointly from the funds of the University and the Commission of Immigration and Housing.

Thereafter under the auspices of the Commission Mr. Collier remained in California and began the work of community organization. Several successful pieces of work were started, notably in San Francisco and in Los Angeles. These experiments are still developing in a very satisfactory manner and other community councils are springing up in other parts of the state; although the Commission was unfortunately forced to release Mr. Collier and to practically withdraw from the work on account of lack of funds.

The present crime wave throughout the country and a study of the causes thereof are bringing to the people of the state an increasing realization of the necessity for the development of healthful and intelligent methods of participation in community affairs on the part of all of our people. This is especially true of the immigrant in whose case the problem of adjustment in the community is at once very important and very difficult.

Through an understanding which has been effected between the Commission and the State Superintendent of Public Instruction, the Commission has provided the services of its Director of Immigrant Education in the work of supervising the instruction of immigrants in the educational institutions of the state. This work has been developed along three general lines as follows:

1. The training of teachers in the normal schools and universities.

2. The supervision of the education of adult immigrants by visiting classes in which instruction is being given.

3. The planning of the extension of this work by the development of new and improved methods of teaching and the institution of courses covering such methods in the state university and in the Normal schools.

This has been a monumental piece of work and has been done with remarkable success by the Commission's Director of Immigrant Education, Miss Ethel Richardson, who also bears the title of Assistant Superintendent of Public Instruction in charge of Americanization.

ACT CREATING THE COMMISSION OF IMMIGRATION AND HOUSING OF CALIFORNIA.

CHAPTER 318.

An act relating to immigrants and immigration, creating a commission of immigration and housing, providing for the employment by said commission of a secretary, agents and other employees, authorizing said commission to fix their compensation, prescribing the duties of said commission, providing for the investigation by said commission of all things affecting immigrants, and for the care, protection and welfare of immigrants, and making an appropriation for the purpose of carrying out the provisions hereof.

(Approved June 12, 1913: Stats. 1913, p. 608; amended, Stats. 1915, p. 848; Stats. 1917, p. 1514.)

SECTION 1. Within thirty days after this act shall go into effect, the governor of the state shall appoint five suitable persons to act as commissioners of immigration and housing. Said commissioners shall hold office and serve solely at the pleasure of the governor and not otherwise.

SEC. 2. Said commissioners shall serve without compensation, but shall be entitled to receive from the state their actual necessary expenses while traveling on the business of the commission, either within or without the State of California.

SEC. 3. The commission shall be known as the "Commission of Immigration and Housing of California." It shall have a seal for the authentication of its orders and proceedings upon which shall be inscribed the words "Commission of Immigration and Housing—California—Seal." Each member of the commission, before entering upon the duties of his office, shall take the oath of office as prescribed by the Political Code for state officers in general, and must execute an official bond in the sum of five thousand dollars. Within thirty days after appointment, the commission shall meet at the State Capitol and organize, selecting a president, a vice-president and secretary. A majority of the commission shall constitute a quorum for the exercise of the powers or authority conferred upon it. Whenever a vacancy occurs in the commission, from any cause whatsoever, such vacancy shall be filled by the governor, as provided in section one for the original creation of the commission. In case of a vacancy, the remaining members shall exercise all the powers and authority of the commission until such vacancy is filled. The commission shall maintain its headquarters and principal office in the city and county of San Francisco, and may establish branch offices at any place or places which in the judgment of the commission may be deemed advisable. The commission may, however, hold sessions at any place other than its offices when the convenience of the commission and the parties interested so requires.

SEC. 4. For the purpose of carrying out the provisions of this act, the said commission is authorized to employ such expert and other employees as it may deem necessary, and upon such terms and for such compensation as it may deem proper. The said commission shall have power to enter into contracts of employment with such persons as it may desire to employ for a definite period of time; but no contract shall be made for more than one year. The employees of the commission shall be entitled to receive from the state their actual necessary expenses while traveling on the business of the commission, either within or without the State of California.

SEC. 5. The Commission of Immigration and Housing shall have the power to make full inquiry, examination and investigation into the condition, welfare and industrial opportunities of all immigrants arriving and being within the state. The commission shall also gather information as to the agricultural possibilities and opportunities for settlement on land within the state; such information to include soil and agricultural surveys of the arable land within the state and other data relating to the price and productivity of land. The commission shall also have power to collect information with respect to the need and demand for labor by the several agricultural, industrial and other productive activities, including public works, within the state; to gather information with respect to the supply of labor afforded by such immigrants as they shall from time to time arrive or be within the state; to ascertain the occupations for which such immigrants shall be best adapted, and to bring about intercommunication between them and the several activities requiring labor which will best promote their respective needs; to investigate and determine the genuineness of any application for labor that may be received and the treatment accorded to those for whom employment shall be secured; to cooperate with the

state employment bureaus, municipal employment bureaus, and with private employment agencies within the state, and also with the employment and immigration bureaus conducted under the authority of the federal government or by the government of any other state, and with public and philanthropic agencies designed to aid in the distribution and employment of immigrants; and to devise and carry out such other suitable methods as will tend to prevent or relieve congestion and obviate unemployment; and to collect and publish, in English or foreign languages, for distribution among immigrants, in, or embarked for, California, such information as is deemed essential to their protection, distribution, education and welfare, and said commission is hereby empowered and authorized to have printed by the state printer any such reports or information, records or proceedings as it may deem necessary or proper; and if for any reason the state printer is not equipped to do any part of said work, then the said commission shall have the right and the authority to have the same done elsewhere upon such terms and conditions as it may deem proper.

SEC. 6. The commission shall cooperate with the proper authorities and organizations, federal, state, county, municipal and private, with the object in view of bringing to the immigrant the best opportunities for acquiring education and citizenship. To that end it shall procure from, or with the consent of, the federal authorities, complete lists giving the names, ages and destination within the state of all immigrant children of school age, and such other facts as will tend to identify them, and shall forthwith deliver copies of such lists to the superintendent of public instruction or the several boards of education and school boards in the respective localities within the state to which said children shall be destined, to aid in the enforcement of the provisions of the education law relative to the compulsory attendance at school of children of school age. The commission shall further cooperate with the superintendent of public instruction and with the several boards of education in the state to ascertain the necessity for and the extent to which instruction should be imparted to immigrants within the state and to devise methods for the proper instruction of adult and minor aliens in the English language and other subjects; and in respect to the duties and rights of citizenship and the fundamental principles of the American system of government; and shall cooperate with the proper authorities and with private agencies to put into operation practical devices for training for citizenship and for encouraging naturalization. It shall be the aim to communicate this instruction to the immigrant as soon after his arrival as is practicable. The commission shall cooperate with the proper authorities to extend this education for both children and adults to labor camps and other localities from which the regular schools are not easily accessible. The commission in cooperation with the proper authorities and organizations shall encourage the establishment of playgrounds and other recreational activities, and also the establishment of settlements and social centers in cities and towns.

SEC. 7. With the object in view of rendering to the immigrants that protection to which they are entitled, the commission of immigration and housing may inspect all labor camps within the state, and may inspect all employment and contract agencies dealing with immigrants or who secure or negotiate contracts for their employment within the state; may investigate the banking relations that exist between immigrants and laborers; may investigate and inspect institutions established for the temporary shelter and care of immigrants and such philanthropic societies as shall be organized for the purpose of securing employment for or aiding in the distribution of immigrants, and the methods by which they are conducted; and shall investigate housing conditions under which immigrants live, and sanitary and safety conditions under which immigrants are employed; it shall further investigate conditions prevailing at the various places where immigrants are landed within the state and at the several docks, ferries, railway stations, and on trains and boats therein, and shall investigate any and all complaints with respect to frauds, extortion, incompetency and improper practices by notaries public and other public officials; it shall further investigate the relations existing between immigrants and steamship and railway ticket agents, hotel runners, cabmen, baggagemen, interpreters and pawnbrokers; it shall further investigate the dealings carried on between immigrants and real estate firms or corporations; and as the result of any of the above inspections or investigations, if it should find evidences of fraud, crime, extortion, incompetency, improper practices or exploitation, it shall be the duty of the commission of immigration and housing to present to the proper

authorities the evidences for action thereon, and shall bring to bear all the authority within its power to see that justice is rendered. The commission shall also encourage the establishment of legal aid societies.

SEC. 8. With the further object in view of bringing to the immigrant the best protection the state can afford, it shall be the duty of the commission to call to the attention of the proper authorities any violations it may discover of the laws pertaining to the payment of wages, to the mode of paying, pertaining to the child labor laws, the employment of women, factory inspection laws, weekly day of rest laws, protection of labor under buildings laws, protection of labor under public works laws, laws relating to the white slave traffic, and laws of the state and county and municipal health departments; the tenement house laws, and other laws pertaining to housing conditions. The commission shall investigate and study the general economic, housing and social conditions of immigrants within the state, for the purpose of inducing remedial action by the various agencies of the state possessing requisite jurisdiction; and shall generally, in conjunction with existing public and private agencies, consider and devise means to promote the welfare of the state. The members of the commission of immigration and housing or any of their authorized agents shall have the right to enter into tenement houses, buildings and dwelling places for the purpose of inspecting such houses, buildings, and dwelling places to secure compliance with state tenement and building acts and municipal building ordinances and to prevent violation thereof, and shall have the right to examine the records of the various city departments charged with the enforcement of the tenement house law and other building regulations and to secure from them reports and copies of their records at any time.

SEC. 9. The commission shall have the right to demand of all officials, state, county and municipal, and it shall be the duty of said officials to supply, such information and references to records as will enable the commission to carry into effect the provisions and intent of this act; and shall have the right to enter upon private property to make investigation for the purposes of carrying out the provisions of this act. For the purpose of carrying out fully the intent and spirit of this act, the said commission shall have full power and authority to gather any and all such evidence as it may deem proper and necessary in order to present the same to the proper authorities for the purpose of instituting prosecutions against any and all persons, firms or corporations found violating any of the laws of any municipality, county or of the state or of the federal government, concerning any of the matters in this act referred to.

SEC. 10. For the purpose of carrying out to the fullest extent the provisions hereof, the said commission or any member thereof shall have power to hold hearings for the purpose of investigation or inquiry, and for the purpose of reaching an amicable settlement of controversies existing between persons, firms, and corporations mentioned herein; and to this end and purpose, the said commissioners and each of them and such person as may be designated in writing by said commission, are hereby authorized and empowered to subpoena witnesses to appear at such hearings and to administer oaths. No decision shall be termed to be final until ratified and approved by the said commission and filed in its office. (Amended Stats. 1915, p. 848.)

SEC. 11. For the purposes of this act, the words immigrant and immigration shall refer to any alien who is within the state, either permanently or temporarily domiciled here, or in transit, or passing through the state to a contiguous state or territory; said words shall further refer to any alien who may first have taken up residence in some other state or in one of the federal territorial possessions, and then shall have removed to this state; said words shall further refer to all aliens coming to and being within the State of California. For the purpose of this act the word alien shall refer to all persons who are not native born or who have not received their final citizenship papers under the naturalization laws of the United States.

SEC. 12. This act shall not be construed to authorize or direct the commission of immigration and housing to induce or encourage immigration into this state or the United States.

SEC. 13. The commission of immigration and housing shall make an annual report to the governor, on the second day of January, of the operation of the commission.

SEC. 14. The sum of fifty thousand dollars is hereby appropriated out of any moneys in the state treasury not otherwise appropriated, for the purpose of carrying out the provisions of this act; and the State Controller is hereby authorized and

directed to draw warrants upon such sum, from time to time, upon the requisition of said commission, approved by the board of control; and the state treasurer is hereby authorized and directed to pay such warrants.

SEC. 15. The commission may make investigations of the housing of immigrants and working people and of city planning in California and elsewhere, may encourage the creation of local city planning commissions and may furnish information as to the progress of other cities for the use of such commissions. It may investigate and report upon defective housing and the evils resulting therefrom and the work being done to remedy the same in California and elsewhere. It may make studies of the operation and enforcement of building and tenement house laws, of housing finances and taxes, of zoning and districting regulations and may promote the formation of organizations intended to increase the supply of wholesome homes for the people, and aid in the enforcement of any laws enacted to promote the purposes for which the commission is established. (Added by Stats. 1917, p. 1514.)

SEC. 16. It shall be the duty of each and every city planning commission or housing commission of any incorporated city or town in the State of California to file on the first day of June of each year with the secretary of the commission of immigration and housing of California a complete report of its transactions and recommendations to any municipal organization or private person or corporation during the previous year, and particularly to report any conflict in authority, lack of cooperation with local municipal authorities or with adjoining cities, with recommendations for needed legislation to properly carry on the development of their housing and city planning work. The commission may annually, or oftener, call a conference of representatives of these commissions, of local health officers, housing inspectors, building inspectors or such other municipal officers as it shall deem advisable to carry out the purposes of this act. The commission may employ city planners and other persons whose salaries, wages and other necessary expenses of the commission will be provided for out of the funds at the disposal of the commission. (Added by Stats. 1917, p. 1514.)

SEC. 17. The commission may make an annual report on housing and city planning to the governor, which the state printer shall cause to be printed as a public document, and copies of this report shall be filed with each and every local housing and city planning commission in the State of California. The commission is further authorized to furnish information and suggestions from time to time to city governments, housing and city planning commissions and other public, semipublic or private bodies such as may, in its judgment, tend to promote the purposes for which the commission is established. (Added by Stats. 1917, p. 1514.)

LIST OF PUBLICATIONS ISSUED BY COMMISSION OF IMMIGRATION AND HOUSING OF CALIFORNIA.

(NOTE.—The publications marked * are out of print, but are on file in the Commission library, 214 Underwood Building, San Francisco. The others are for free distribution and may be had at any office of the Commission.)

1. *Report on Unemployment to His Excellency, Governor Hiram W. Johnson	1914
2. *Advisory Pamphlet to Employers, Setting Forth State Requirements as to Labor Camp Sanitation	1914
3. *First Annual Report of Commission, January 2, 1915	1915
4. *Report on Relief of Destitute Unemployed, 1914-15, to His Excellency, Governor Hiram W. Johnson	1915
5. *Advisory Pamphlet on Camp Sanitation and Housing (see No. 29 below)	1915
6. A. B. C. of Housing	1915
7. *Plan for a Housing Survey	1916
8. *Second Annual Report of Commission, January 2, 1916	1916
9. Immigrant Education Leaflets, 1, 2, 3 and 4	1916
10. *The Home Teacher: the Act, with Working Plan and Forty Lessons in English	1916
11. *Discussion of Methods for Teaching English	1917
12. *Report on Experiment Made in Los Angeles in the Summer of 1917 for the Americanization of Foreign-born Women	1917
13. *The Spirit of the Nation, as Expressed in Song and the Words of Famous Americans	1918
14. Our Soldiers and the English Language	1918
15. Report on Fresno's Immigration Problems	1918
16. A Community Survey Made in Los Angeles City	1918
17. *Primer for Foreign-speaking Women: Parts 1 and 2	1918
18. State Housing Manual: the Three California Housing Laws, annotated	1919
19. *Americanization, the California Program	1919
20. *Americanization, Suggested Lines for Speakers and Workers	1919
21. Suggestions for Speakers (revised and extended)	1919
22. *Manual for Home Teachers	1919
23. *Heroes of Freedom, first edition (see No. 31 below)	1919
24. Annual Report of the Commission, January 2, 1919	1919
25. Report on Large Landholdings in Southern California	1919
26. Rules for Labor Camps	1919
27. Same, Japanese Text	1919
28. Same, Spanish Text	1919
29. Advisory Pamphlet on Camp Sanitation and Housing (revised)	1919
30. A Suggested Program for Americanization: reprinted by permission of the General Federation of Women's Clubs	1919
31. Heroes of Freedom, second edition (revised)	1920
32. Bulletin of Information for Immigrants	1920
33. Same, Italian Text	1920
34. Same, Spanish Text	1920
35. Americanization: California's Answer	1920
36. Immigration and Housing Bulletin for September	1920
37. Immigration and Housing Bulletin for November	1920

THIRD BIENNIAL REPORT

OF THE

California State Department of
Weights and Measures

1919-1920



SACRAMENTO, CALIFORNIA

DECEMBER, 1920

CALIFORNIA STATE PRINTING OFFICE
Sacramento, 1920

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HON. WILLIAM D. STEPHENS,
Governor of California.

LETTER OF TRANSMITTAL.

*To His Excellency, WILLIAM D. STEPHENS,
Governor of the State of California.*

SIR: In accordance with section 13 of chapter 597 of the Statutes of California, approved June 16, 1913, I have the honor to herewith transmit to you, and through you to the honorable state Legislature, the third biennial report of the State Department of Weights and Measures, from December 1, 1918, to December 1, 1920.

Respectfully submitted.

CHARLES G. JOHNSON,
State Superintendent of Weights and Measures.
SACRAMENTO, CALIFORNIA, December 1, 1920.

FOREWORD.

The Third Biennial Report of the service of the state and county department of Weights and Measures is a history of conscientious labor by practical men sincerely devoted to make this service truly helpful and useful.

I am sincerely grateful to every member of the service for their splendid co-operation and serious application to their duties, and commend the uniform efficiency effectively demonstrated in the work, by every county official.

The splendid co-operation of the public is a gratifying expression of the merit of the service, and it is my earnest prayer that in future it will associate itself even more closely, thereby obtaining in greater volume the benefits of well grounded laws intended for their welfare and protection.

CHARLES G. JOHNSON,
State Superintendent.



CHARLES G. JOHNSON.
State Superintendent of Weights and Measures.

INTRODUCTORY REVIEW.

PROTECTING OUR NATIONAL SYSTEMS OF WEIGHTS AND MEASURES.

By CHAS. G. JOHNSON.

The extensive propaganda of factional proponents of our two systems of weights and measures is developing commercial conflict to the general disadvantage of the liberal employment of our standards.

Like many other nations, the United States has adopted and legalized the metric and imperial standards of length, capacity and weight, and these two systems are uniformly employed as circumstances require to the full satisfaction of industry and commerce.

In my twelve years of practical enforcement of weights and measures laws and study of the application of our systems, I have found industry and commerce in perfect harmony in their employment of both systems. In late years proponents of one of our two systems have organized themselves into "institutes" or "clubs" to foster and promote conflict and contention in the practical employment of our two legal systems, which has placed a heavy stress upon the functions of our National Bureau of Standards and developed considerable commercial irritation.

The protection of our systems of weights and measures is of national importance equal to the protection of our systems of currency. Weight and measure forms the basis for our money exchange and on the accuracy of the weight depends the honesty of the monetary exchange; in fact, pounds and ounces, in avenues of trade, are equivalent to dollars and cents.

In protecting our systems of weights and measures against improper employment, we prevent commercial misconduct, injustice and erroneous competition. These evils retard and irritate our commercial activities, place a premium on commercial honesty and develop conflict in trade where harmony is essentially necessary.

Our systems are of great state and national importance in that they form the foundation of our commercial structure in our trade relations between ourselves and with the world. Still of greater importance, however, is the honest employment of these standards in the avenues of trade, and to safeguard their employment and prevent their being used to facilitate the perpetration of fraud, the state government, through the agency of the department of Weights and Measures has promulgated and approved specifications and tolerances

which regulate the manufacture of every type of weighing and measuring device.

By this safeguard the public is protected against false and fraudulent devices which prior to this regulation **virtually defeated honesty** in weighing and measuring. This fact is sustained by the early activities of this department which during its year of inception confiscated and destroyed forty-five thousand one hundred twenty-eight false and inaccurate devices and corrected seventy-one thousand four hundred eighty-four. The estimated saving, although millions, cannot be compared with the moral and commercial good resulting.

The human question which associates itself in the employment of the scale, represents our commercial morale, for the most accurate scale may be defiled by dishonest employment. If the scale had a conscience, heaven would be crowded and commercial integrity would be unimpaired. The all-important force, therefore, essential for the protection of the honest employment of our systems of weights and measures, is the moral force. The development of this force for the protection of this morale or principle, has called for the enactment of restrictive laws under which the violation of our standard is restricted by penalties which make for integrity and protects honesty and legitimate competition.

Within the powers of these laws comes the inspection service and the activities of the officials charged with the enforcement of restrictions against false standards and customs in conflict with commercial honesty.

This public agency compares all weights and measures and devices employed in the avenues of trade with copies of the national standards and specifications. These standards are to him like the compass of the mariner, for only by actual comparison and test can he determine the accuracy of the commercial weighing devices.

In our systems today we employ several units which were adopted during early pioneer days and which may now well be relegated. For example, our units of dry measurement have been gradually replaced by the more accurate avoirdupois weight. A bushel of potatoes is an unknown quantity unless it has a fixed equivalent in avoirdupois pounds. A bushel of onions in Indiana is equivalent to forty-eight pounds, while in New York it is fifty-seven pounds. The dry quart is nine cubic inches greater than the standard liquid quart and its employment is confusing and facilitates the perpetration of fraud.

In the west the dry units of measure are unknown and they should be discarded throughout the nation as inaccurate and antedated.

The fundamental and underlying principle in the employment of our systems is that they must determine and express quantity, and when quantity is determined as a basis for money exchange, it must be a true and accurate record of net weight, and by "net weight" is meant the exact weight of the commodity represented and sold, exclusive of all other elements such as containers, wrappings, or elements necessary in transportation.

The principle of net weight forming the basis for monetary exchange in sale of commodities in containers inspired the enactment of the net container act, which is today observed by all responsible packers and manufacturers, and regarded as the most important of laws affecting state and interstate trade, in commodities packed in containers.

This act requires that all food commodities when sold in containers must declare the true quantity on the labels. The purchaser is thereby protected in his purchase of commodities in containers and the possibility of deception effectually prevented.

The net container act is limited to apply to food in package form. It is, however, not far distant when the underlying principle of this act will be extended to every commodity when sold in containers, whether it be paint or canned beef.

It is just as important to protect the purchaser against deception and fraud in quantity in the sale of gasoline and nails as it is in the sale of salmon and baking powder.

Economic laws of this character dealing with our systems of exchange were bitterly contested by group and combination, whose business methods were based on selfish and discriminating policies of trade, adopted under the pretense of commercial emergency. These trade customs placed a most unfair burden on that great mass of people who could least protect themselves and least afford to lose, and for a time seriously menaced our systems of standards. It was only by the timely action of our legislature that relief was provided by enactment of state laws.

Our national government deemed it wise to leave the protection of our systems of weight and measure to state agencies under state powers. These agencies are regarded as the authorized custodians of our standards, and are vested with powers to prohibit deception and fraud, and it becomes their duty to safeguard public policy in matters of weights and measures.

The significance of this supervision may be expressed by the fact that today this department holds \$1,600,000 in bonds from public warehousemen and public weighmasters, guaranteeing the honest employment of our standards and the accurate records of their weighings.

Honest weights and measures forming the basis for settlement in trade has been a world problem since the beginning of time. The "Book of the Dead" records one of its commandments as "Thou shalt not defile the plummet of the scale." This principle is expressed in the Mosaic Law; it forms the keystone in our moral standards and is a constitutional part of all governments.

The day will come when the nations of the world will see the wisdom of adopting one universal system of weights and measures, and toward that end Congress should awaken to its importance as a factor in our trade relations with the world.



False weights and measures condemned and confiscated by Los Angeles County.

"NET WEIGHT PRINCIPLE."

The fundamental purpose of weighing is to obtain a truthful record of quantity on which to base exchange of the commodity for money value. On the truthfulness of such record depends the honesty of the selling transaction, and it was for the purpose of safeguarding the truthfulness of weight records, forming the basis of settlement, that the weights and measures laws were enacted. True net weight, therefore, is the foundation upon which our system of commercial exchange must rest, notwithstanding trade customs to the contrary.

The weights and measures laws take a firm and definite stand against the sale of commodities by gross weight. These laws express in definite and mandatory language the intentions of the legislature, and delegate no privilege, under any circumstances, to the contrary. This department must, therefore, regard the enforcement of the net weight principle as its plain duty.

The record of weight forming the equivalent for money value must be the true net weight of the commodity sold, without evasions or reservations. Our standards of weight, when forming the basis for settlement in money value, are of equal importance to our standards of currency. Volume in weight equals value in currency.

To include in the weight forming the basis for settlement the weight of the container, or any element other than the commodity sold, is an erroneous departure from the principle of honest weight, and against which the law takes a firm and determined stand. To compromise this principle is a violation of a fundamental which can only result in prejudice and injustice. Net weight means honest weight in the commercial sense. The exchange of commodities for money value by gross weight, or any weight other than net weight, defeats the principle on which this service was conceived and established. We have, therefore, without fear of serious contention, enforced this principle with a sense of security and satisfaction that only the power of right can provide. We have considered ourselves the custodian of these principles and have assumed responsibility for the protection of commercial honesty and integrity, and have fearlessly approached and attacked every practice that encroached upon or defeated the principle of net weight. Had we done otherwise, we would have failed in the purpose of our work and failed to justify the confidence which the public reposes in the service.

**COUNTY SEALERS AND DEPUTY COUNTY SEALERS HAVING JURISDICTION
IN COUNTIES OF THE FIRST TO THE THIRTY-FIFTH CLASS.**

Los Angeles.....	Chas. M. Fuller	Sacramento.....	James Duffee
Deputies:		Deputy:	
C. J. Buck		R. N. Philpot	
J. D. Fisher		San Diego.....	Virgil Bruschi, Jr.
F. J. Berka		San Bernardino.....	S. G. Batchelor
Wesley Bartley		San Joaquin.....	O. T. Melton
Vincent J. Gray		Deputy:	
F. W. Bundy		W. E. Herson	
R. D. Haskell			
D. D. Didie		Sonoma.....	John L. Gist
San Francisco.....	A. J. Gallagher	Kern.....	R. R. Lucas
Deputies:		Tulare.....	F. F. Badoux
Jas. A. Hughes, (Chief Deputy)		Riverside.....	Chas. M. Shields
Thos. B. Slevin		Orange.....	George McPhee
Henry McMahon		Humboldt.....	Mrs. R. D. Johnston
Mrs. Margaret Dolan		Contra Costa.....	F. Judson Eglow
Chas. Wentworth		Santa Barbara.....	J. N. Watson
Sam Wacholder		Solano.....	John Cunningham
Chas. Hornung		Butte.....	F. C. Mekellos
Alameda.....	Edw. K. Strobridge	San Mateo.....	Mathew M. Grady
Deputies:		Santa Cruz.....	M. W. Walker
M. P. Scott		Marin.....	M. C. Doody
J. J. Donovan		Monterey.....	John E. Wallace
E. G. Murphy		Mendocino.....	W. B. Coombs
John Carey		Stanislaus.....	C. E. Tucker
Dave Boyle		San Luis Obispo.....	R. L. Dempsey
Santa Clara.....	A. G. Walker	Shasta.....	S. S. Stickley
Fresno.....	F. B. Johnson	Siskiyou.....	R. O. Gwyn
Deputies:		Ventura.....	Geo. S. Wilson
J. B. Smith		Placer.....	C. F. Richter
A. W. Treadwell		Kings.....	J. C. Griswold
F. S. Granger		Merced.....	Roy P. Thorpe

**"STATE DEPUTY SERVICE IN COUNTIES OF THE THIRTY-SIXTH TO
THE FIFTY-EIGHTH CLASS."**

Section 17 of the Weights and Measures Act provides in part:

In all counties other than those of the first to thirty-fifth classes, both inclusive, no county sealer or deputies shall be appointed by the legislative body thereof, but the State Superintendent of Weights and Measures shall assign to such counties, or groups of such counties, such deputy superintendents as may be necessary, but not more than one to each of such counties. And, the period of service in each county shall not exceed one hundred and twenty days in any one year.

In compliance with these provisions, I have caused a complete annual inspection to be made of all counties of the thirty-fifth to fifty-eighth class, and enforced therein all the provisions of the several weights and measures laws.

The names of the Deputy State Superintendents and their schedule of their jurisdiction follows:

J. C. Kesler—Nevada, Plumas, Sierra, Trinity and Napa counties.

J. W. Wylie—Imperial, Modoc, Lassen and Inyo counties.

A. M. Wallen—El Dorado, Calaveras, Amador, Mono, Alpine and Tuolumne counties.

B. P. Jennings—Yuba, Yolo, Madera and Mariposa counties.

- P. H. Northey (County Sealer for Colusa County)—Tehama, Glenn and Lake counties.
Mrs. M. E. Johnston (Sealer for Humboldt County)—Del Norte County.
J. H. Lamme—Sutter County.
A. D. Shaw—San Benito County.

The Deputy State Superintendents engaged in this service are practical and competent men, thoroughly familiar with their duties, and physically able to properly perform them.

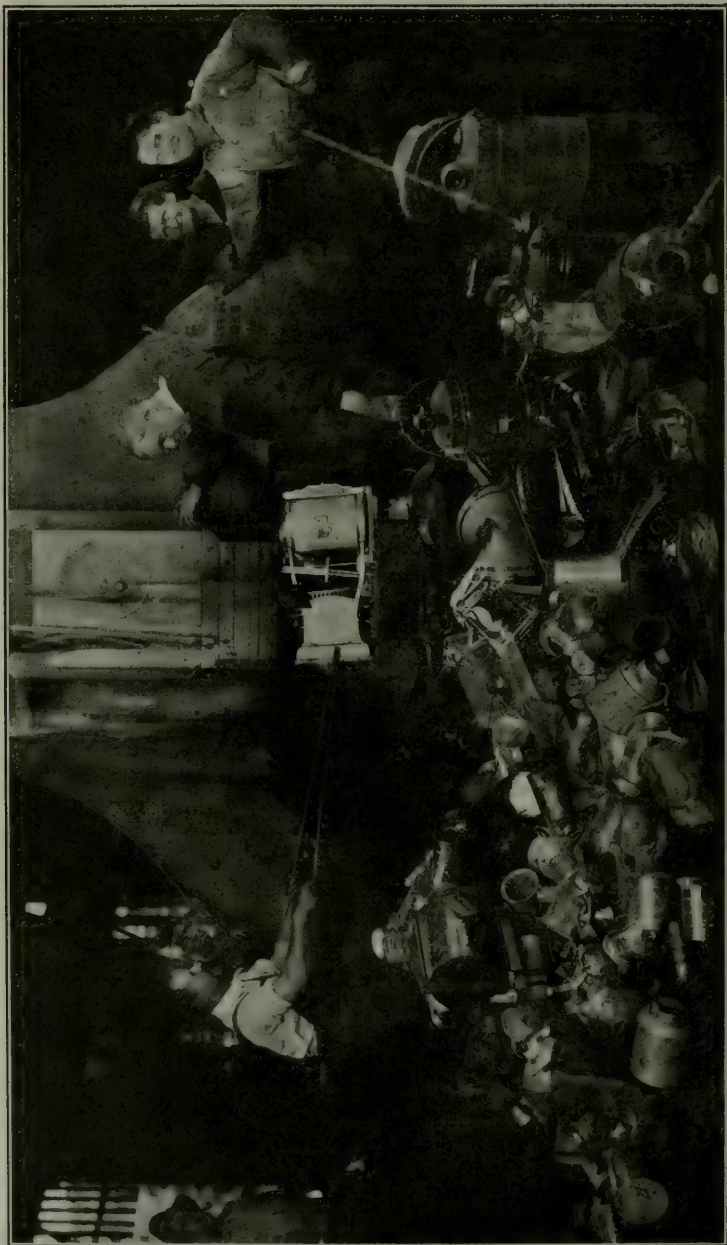
We have obtained uniform cooperation of the legislative bodies in these counties and no complaint over expense of service has been registered, and no faults have been found with the service.

The people in these counties are keen in their appreciation of the value of the service and avail themselves constantly of its protection and assistance.

Several counties other than those in the classification mentioned have requested this department to detail a State Deputy to act as County Sealer of Weights and Measures during the period necessary to properly perform the duties. Whenever a State Deputy was available I have complied with these requests and found the arrangement satisfactory both to the department and to the county.

Due to the peculiar requirements of persons engaged in the service, I have at all times strenuously endeavored to divorce the department entirely from political influences. The county appointment, as a rule, were men of sterling character and men willing to seriously apply themselves. Many, however, were of the opinion that the service would provide annual employment. Such, however, was not the case, for the work in counties of the thirty-fifth to the fifty-eighth class should be thoroughly performed within a period not to exceed four months.

Under the scheme of grouping several counties to a deputy superintendent, it provides for him annual employment and the efficiency of the service is not impaired by long periods of nonemployment. In every instance, I have assigned only men well trained in their duties and thoroughly familiar with all weights and measures laws and policies of this department. They were constantly admonished to render this service expeditiously at the lowest possible expense to the county, and it is with satisfaction that I can conscientiously testify that the deputies have performed their duties in this respect with full satisfaction to the people, and the approval of the county legislative bodies.



The fitting end of an iniquitous career. Condemned false weighing and measuring devices being broken up to be saved as junk.

"INSPECTION OF STATE INSTITUTIONS."

Conforming to the provisions of Section 10 of Chapter 597, I have caused an annual inspection to be made of the weights and measures, and the weighing and measuring devices, employed in all state institutions, which includes state hospitals, penal institutions, institutions of learning, Agricultural Park, University Farm, and many of the state offices where apparatus is employed.

Under date of November 18, 1919, I obtained approval from the State Civil Service Commission for employment of A. M. Wallen, Deputy State Superintendent, who was detailed to make inspection of all state institutions; and, for 1920 I obtained a like appointment of J. W. Wylie.

The time consumed in making these inspections is approximately seventeen working days.

By our inspections we have corrected and caused to be accurate all good apparatus, and by a careful process of elimination caused to be replaced all poor and inaccurate apparatus, and have seriously impressed upon the persons doing the weighing the importance of carefully checking all commodities delivered at the institutions.

A careful inspection has been made of commodities in containers, and where variances have been found or reported, the persons responsible have been warned, and in several cases prosecuted.

I have earnestly endeavored to obtain the cooperation of all institutions, to the end that the state be afforded every protection intended under the weights and measures laws.

The following communication was forwarded to all institutions under date of December 6th:

I will thank you to kindly cooperate with this department in obtaining delivery at your institution of commodities purchased by the state on a net weight basis. Section 32a of the Weights and Measures Act provides as follows:

"No person shall by himself or his employee or agent, or as the employee or agent of another sell or offer or expose for sale any commodity, produce, article or thing at, by, or according to gross weight or measure, or at, by, as, of, or according to any weight, measure or count which is greater than the true net weight, measure or count thereof, or which is less than the standard net weight, standard net measure or standard net count, including tolerances, as such standards and tolerances are now or may hereafter be established pursuant to the provisions of this act. Any person violating any of the provisions of this section shall be guilty of a misdemeanor."

This law makes it a misdemeanor to sell commodities by gross weight. Many merchants selling edibles endeavor to defeat the net weight principle by contending that the variance is due to shrinkage, while as a matter of fact the commodity was actually billed on gross weights. The net weight principle is uniformly observed by wholesale and retail merchants and there is no good reason why the state should not obtain delivery by net weight.

Any edibles shipped to our institutions on a net weight basis at point of origin will hold this weight and should check upon reweigh at the institution. Where point of origin net weights are accurate they should express no variance in deficiency at point of destination.

The rigid observance of net weight forming the basis for settlement in purchases by the state will protect the state against carelessness and fraud and result in a great saving.

Assuring you of my earnest desire to assist you in these matters in so far as the Weights and Measures Laws apply, and appreciating your cooperation.

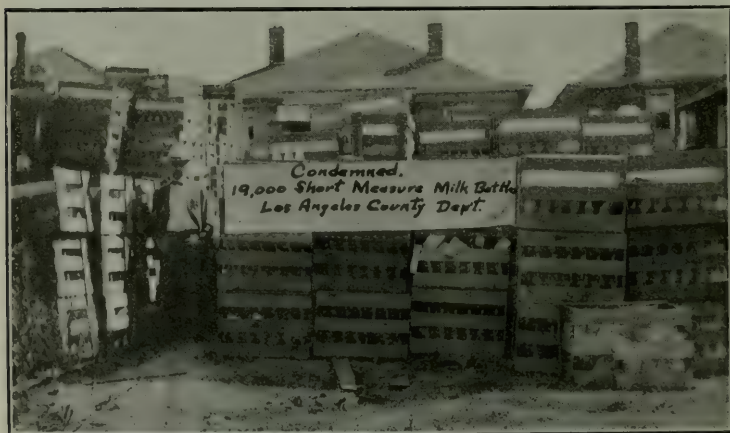
The following is a report of inspections for the years 1919 and 1920:

Inspection of Apparatus in State Institutions, 1919.

	Scales	Measures	Weights
Inspected	252	72	654
Corrected	121		218
Condemned for repair	28	1	
Destroyed	34	12	92
Sealed	190	60	525
Commodities in containers inspected			1,468
Light		310	
Heavy		32	
Correct		1,126	

Inspection of Apparatus in State Institutions, 1920.

Inspected	234	81	662
Corrected	104		305
Condemned for repair	16		
Destroyed	12	19	28
Sealed	206	62	634
Commodities in containers inspected			2,080
Light		410	
Heavy		80	
Correct		1,590	



Result of inspection of milk bottles in Los Angeles County, by Chas. M. Fuller.

"PRECISION AND OTHER TESTS."

Section 21 of the Weights and Measures Act requires that all standards issued by county sealers and other deputies shall be tested by the Superintendent during each biennial period, and as often as circumstances require.

Copies of all standards of weight and measure certified to by the National Bureau of Standards constitute part of the equipment of the state office, and are used in calibrating the standards employed in the field service by the sealers.

The calibration of these working standards requires the highest degree of accuracy and it is a slow and tedious work. All errors noted by comparison with the state standards, on the most scientific weighing apparatus obtainable, are corrected and state certificates of accuracy covering each test is issued, noting therein each correction.

The calibration of scientific weighing and measuring devices of every type and character submitted by the public, as well as commercial weighing and measuring devices, is constantly growing and places a heavy tax on the personnel of the department.

During the biennial period the following weights and measures were calibrated:

- 3087 avoirdupois standard test weights.
- 1374 apothecary standard test weights.
- 1218 troy standard test weights.
- 1160 metric standard test weights.
- 714 standard liquid capacity measures.
- 408 cylindrical graduates.
- 142 linear measures.
- 632 miscellaneous standards for commercial use.

"SPECIFICATIONS AND TOLERANCES."

The Specifications and Tolerances adopted heretofore have been found practical and applicable to the manufacturers of apparatus as well as in our inspection service, and no changes of importance will be recommended, excepting in the tentative specifications and tolerances for liquid measuring pumps, which will be arranged to conform with the specifications and tolerances for liquid measuring devices adopted and recommended by the 1920 Annual Conference on Weights and Measures held at Washington, D. C.

"ANNUAL CONFERENCES AND DEPARTMENT EXAMINATIONS."

The third annual conference or school of instruction, for the weights and measures officials of the state, was held at the Municipal Auditorium in Oakland on the twenty-seventh, twenty-eighth and twenty-ninth of August, 1919.

This conference was attended by nearly all the officials, and each day was confined to the practical study and consideration of matters apper-



Lecture on weights and measures before high school pupils by Clarence E. Tucker, Sealer for Stanislaus County.

taining to weights and measures. New types of apparatus were exhibited and demonstrated and I was able to obtain prominent scale construction authorities to address the officials and demonstrate to them. The value of this school of instruction expresses itself in the work of the sealers making for greater practicability and efficiency.

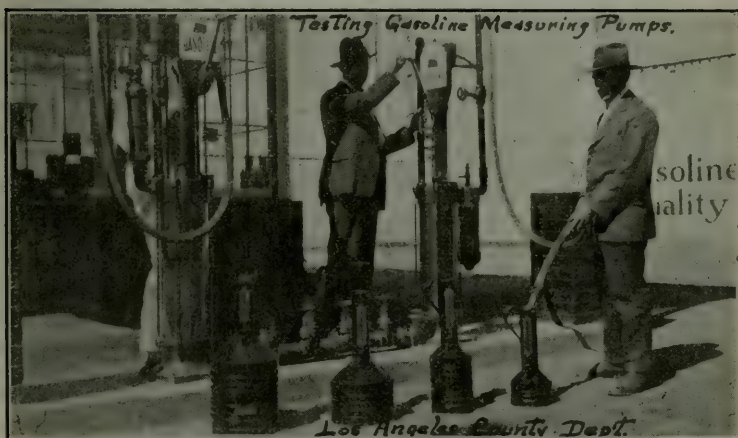
No school of instruction was held in 1920. A departmental examination was substituted. This examination consisted of 20 questions on

each of the following subjects—laws; weights; measures. To convenience a full attendance at these examinations, they were held at San Francisco, Fresno and Los Angeles. The expense of attending was borne by each official.

By your permission I attended the annual conference of weights and measures officials for the United States, held at the Bureau of Standards in Washington, D. C., on May 22nd of this year. I desire to express my sincere appreciation of this privilege and to assure you that the attendance of your superintendent at this conference is most essential for the general benefit of the service throughout the State. I had the honor of being reelected as First Vice-President of this conference and appointed as one of the three forming the National Committee on Specifications and Tolerances.

As a matter of comparison with this service in California and other states, I can conscientiously say that there is no state in the Union where the weights and measures officials are as uniformly practical and efficient as they are in the State of California.

In recognition of the importance of the annual conference, the Chamber of Commerce of Los Angeles requested Mr. Chas. M. Fuller, the county sealer, to attend at their expense.



Testing the accuracy of gasoline pumps.

"NEW TESTING EQUIPMENT."

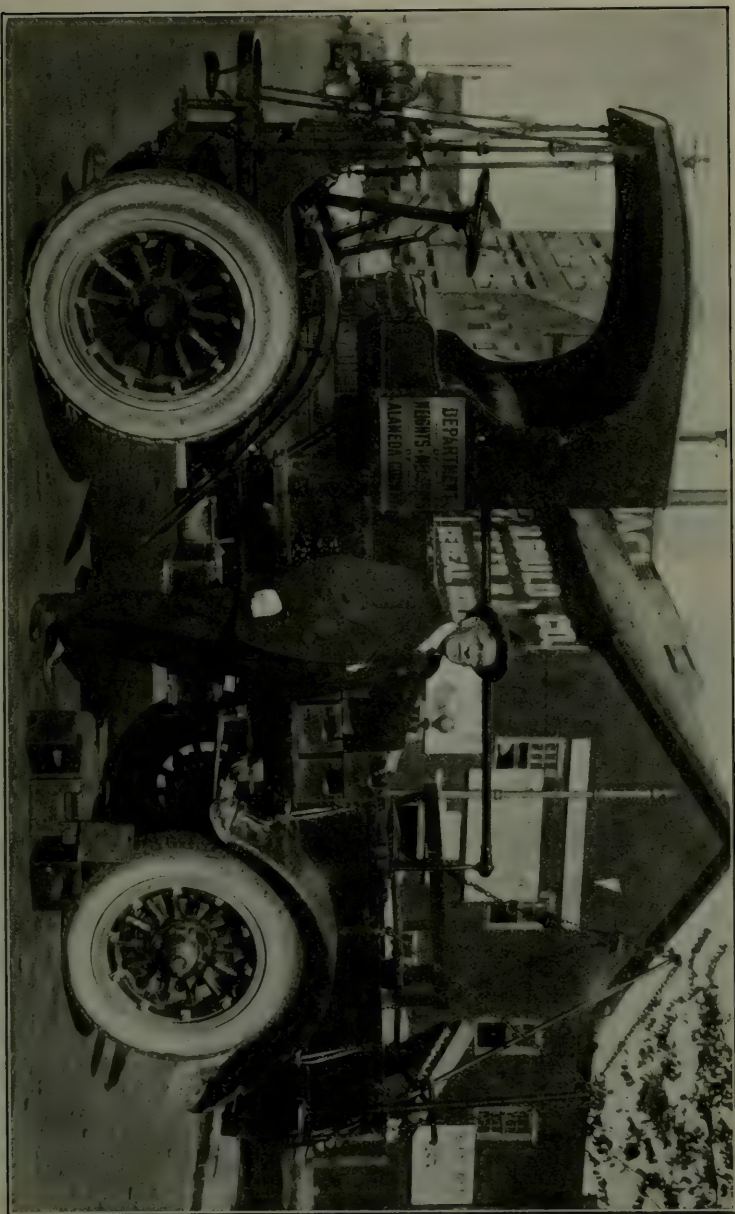
The only way to determine accuracy in apparatus employed by public weighmasters, such as dormant wagon or truck scales, is by actually placing a known load on the platform, and such load should approximate the capacity of the scale. This fact has often been established with the sealers, and I have constantly urged them to obtain the necessary equipment, especially in the large and important counties.

In order to obtain accurate records of weight it is essential that the scales be accurate and this accuracy can only be determined by testing the apparatus under heavy loads. The testing of a 20-ton scale with a thousand pounds of standards is meaningless in so far as determining the accuracy of the scale in excess of the known load. The minimum load for testing a 20-ton scale should be 10,000 pounds, and to accomplish this test the sealer must have available loads in this amount.

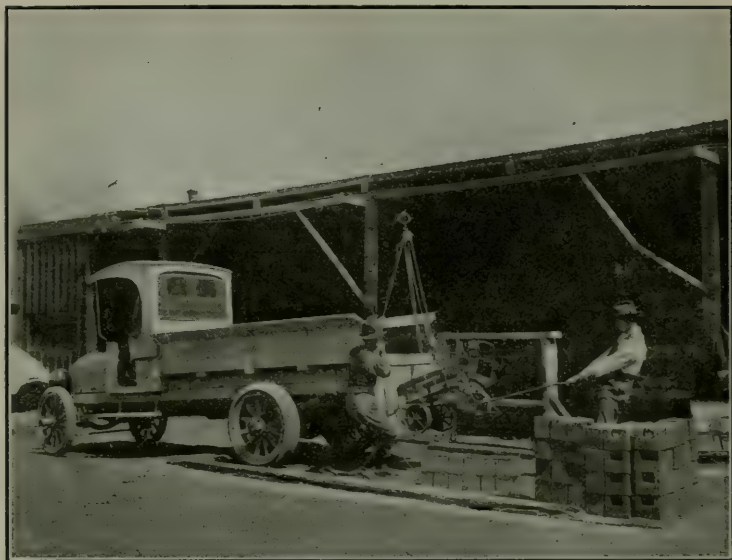
As an expedient device for testing heavy capacity scales, I obtained through the courtesy of the State Highway Commission, an old Garford truck which I caused to be repaired and equipped with devices for testing, including 4000 pounds of 50-pound standards. This equipment has been loaned during 1920 to ten counties at different periods and has there been employed by the various sealers in testing wagon and other dormant scales.

Alameda County, realizing the importance of testing their heavy scales, have provided their sealer with a new truck properly equipped, enabling them to make a spot test of approximately 10,000 pounds. The maximum spot test obtained by the state truck is approximately 9000 pounds. San Joaquin County has also furnished their sealer with suitable equipment for testing heavy capacity scales. The state truck is old and cumbersome, and I beg to recommend that appropriation be made in the next budget for the purchase by this department of a modern truck properly equipped for this service, together with necessary standard weights.

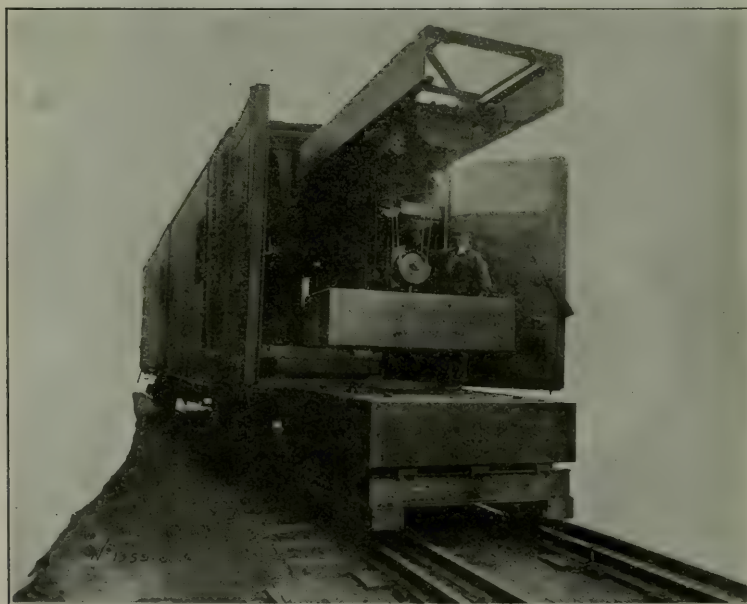
A system can be adopted under which the counties employing this equipment will reimburse the department for the time it remains in employment in the county.



New equipment Alameda County department for testing wagon and auto truck scales.



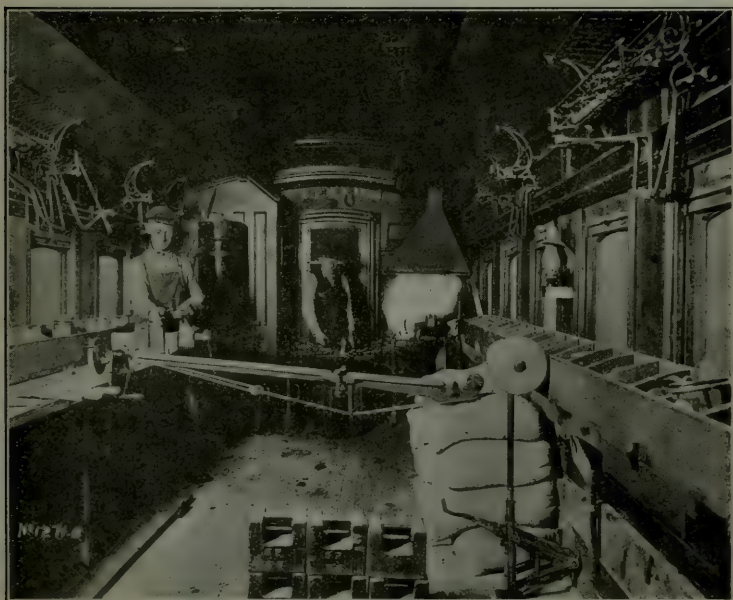
Testing public weighmaster scale, using auto truck for dead load.



Railroad testing equipment of the National Bureau of Standards.

INSPECTION OF RAILROAD TRACK SCALES.

We have seriously concerned ourselves in developing the highest standard of efficiency in the inspection and testing of all weighing devices employed by the railroads throughout the state. The success obtained is due to the splendid cooperation of the persons constituting the railroad track scale departments, maintained by the Santa Fe, Western Pacific, and particularly that of the Southern Pacific, of which Mr. George A. Easton is the superintendent. His thorough knowledge of scale construction and installation has resulted in the elimination of a great deal of poor and antedated apparatus, and the installation of new and modern types of weighing devices of sufficient weighing capacity to weigh maximum loads on any size cars. Most of the old apparatus was limited in its capacity to approximately one hundred ton. No installations are now made of a less capacity than one hundred and fifty ton, all constructed and installed in accordance with our specifications. In addition to the forty thousand-pound test car, one of sixty thousand has been constructed; both of these test cars have been constantly employed, and an order has been placed for the construction of a new test car, which will enable a spot test of ninety thousand pounds. This piece of equipment will cost the carriers \$7,500.



Railroad track scale repair equipment of Southern Pacific.

All track scales, and other scales, employed by the carriers, are tested semi-annually, and as often as conditions require. The same service is extended to all track scales, whether they be the property of the carriers or commercial institutions. For the purpose of maintaining accuracy in the test cars employed by the carriers, a master scale has been installed, which is used for no other purpose than checking the test cars. The master scale is inspected annually by this department, and in which inspection we employ the testing equipment of the National Bureau of Standards. In addition to testing the master scale with the elaborate equipment of the Bureau, we also inspect and test railroad track scales throughout the state. This service is extended annually and enables this department to be well informed as to the condition of the track scales and to make the necessary recommendation for their improvement.

The following report covers the inspection of the track scales throughout the state during this biennial period:

**Report of Work Done by Southern Pacific Scale Department in State of California
During Year 1919.**

Track scales owned by Southern Pacific, capacity from 100 to 150 tons, rebuilt and installed during year 1919.....	22
Track scales, capacity from 100 to 150 tons, rebuilt at Southern Pacific scale shops at West Oakland during year 1919.....	24
Private owned track scales on Southern Pacific lines in California rebuilt and installed during year 1919.....	12
Track scales tested with Southern Pacific test cars Nos. 2510 and 2641, weight of cars 40,000 pounds, in California during year 1919.....	449
New four-ton scales built and supplied Southern Pacific stations in California during year 1919.....	16
Portable scales rebuilt at Southern Pacific scale shop, West Oakland, and supplied stations in California during year 1919.....	188
Dormant freight house and portable scales tested and repaired with Southern Pacific scale repair cars at stations in California during year 1919.....	3209

**Report of Work Done by Southern Pacific Scale Department in State of California
During Year 1920.**

Track scales owned by Southern Pacific, capacity from 100 to 150 tons, rebuilt and installed during year 1920.....	11
Track scales owned by Northwestern Pacific Railroad, and rebuilt and installed by Southern Pacific during year 1920.....	7
Private owned track scales on Southern Pacific lines rebuilt and installed during year 1920.....	9
Track scales tested with Southern Pacific test cars Nos. 2510 and 2641, weight of cars 40,000 pounds, in California during year 1920.....	522
Four-ton dormant scales built and installed in freight houses during year 1920.....	21
Six-ton dormant scales built and installed in freight houses during year 1920.....	6
Sixty-ton wagon scales built and installed by Southern Pacific during year 1920.....	2
Thirty-ton wagon scales built and installed by Southern Pacific Company during year 1920.....	2
Portable scales built at Southern Pacific scale shop during year 1920 and supplied stations.....	201
Dormant freight house scales and portable scales tested and repaired at stations with Southern Pacific Scale repair cars during year 1920.....	4026

REPORT OF WORK DONE BY THE ATCHISON, TOPEKA AND SANTA FE RAILWAY COMPANY SCALE DEPARTMENT IN THE STATE OF CALIFORNIA DURING THE YEAR 1920.

The Santa Fe Railroad system owns and operates twenty-two 150-ton, four-section, steel track scales in the state. These scales are tested three times each year. Suitable and satisfactory apparatus for testing is used. All necessary repairs are made by the company from the tool or shop car which accompanies the testing equipment. In addition to test car inspections, weekly inspections are made by the public weighmasters, and surprise, or efficiency, tests are made monthly.

All apparatus employed for weighing purposes at the various depots and stations are kept up properly and inspected at regular periods during the year and all warehouse trucks are inspected at regular intervals.

The county sealers are notified whenever the test car comes into their county, when they accompany same and assist in the inspection work, and if scales are correct they are sealed by them. The test cars employed by the Santa Fe in their inspection work in this state consist of cars made of metal weighing 32,500 pounds, entire length 12 feet with wheel base six feet four inches, the short wheel base being necessary to enable test of the four sections of the standard 150-ton, 46-foot track scale.



Southern Pacific Railroad track scale repair shop.

The cooperation extended this department by the Santa Fe has been entirely satisfactory and all recommendations of this department have had the careful and prompt attention of Mr. J. B. New, in charge of the scale inspection work. I desire to thank Mr. New for his splendid cooperation and for the splendid cooperation of Mr. J. T. Riggs.

Apparatus Inspected.

Track scales inspected.....	22	
Dormant scales inspected.....	74	
Depot scales inspected.....	198	
Portable scales inspected.....	212	
Counter scales inspected.....	34	
Dial scales inspected.....	47	
Stockyard scales inspected.....	5	
Automobile truck scales inspected.....	6	
Total.....	598	
Standard 130-pound 2-wheel warehouse trucks standardized.....	750	
Standard 400-pound trailer trucks standardized.....	250	
Track scales inspected located at the following stations:		
Bakersfield.....	1 Richmond.....	2
Calwa.....	1 Riverside.....	1
Camp Kearny.....	1 Reedley.....	1
Fullerton.....	1 Riverbank.....	1
Hanford.....	1 San Bernardino.....	2
Kincaid.....	1 San Francisco.....	1
Los Angeles.....	2 San Diego.....	1
Needles.....	1 Stockton.....	1
Oakland.....	2 Visalia.....	1

"CHECK TESTS OF RAILROAD SCALES."

The following table gives the result of recent check tests of railroad track scales made with equipment of the Bureau of Standards. These tests show a marked improvement in railroad track scales over similar tests in the past:

Owner of Scale.	Location	Maximum Error Per Cent.
Southern Pacific.....	Oakland (fill scale).....	- 0.07
Southern Pacific.....	Oakland (homestead scale).....	- 0.13
Western Pacific.....	Oakland.....	+ 0.15
Moore Shipbuilding Company.....	Oakland.....	+ 1.00
Sperry Flour Company.....	Stockton (Union Mill scale).....	- 0.18
Sperry Flour Company.....	Stockton (Capitol Mill scale).....	- 0.06
Southern Pacific.....	Bakersfield.....	- 0.21
Southern Pacific.....	Mojave.....	- 0.16
Capitol Milling Company.....	Los Angeles.....	- 0.12
Southern Pacific.....	Los Angeles (shop scale).....	- 0.07
Southern Pacific.....	Los Angeles (Midway scale).....	+ 0.12
Southern Pacific.....	Tolton.....	+ 0.09
Southern Pacific.....	Niland.....	+ 0.09
Southern Pacific.....	Callexico.....	+ 0.07
Railroad owned scales tested.....	No. 10.....	Errors within tolerance 9
Industry owned scales tested.....	No. 4.....	Errors within tolerance 3
Total scales tested.....	14.....	12

Maximum test, 90,000 pounds.
Minimum test, 45,000 pounds.

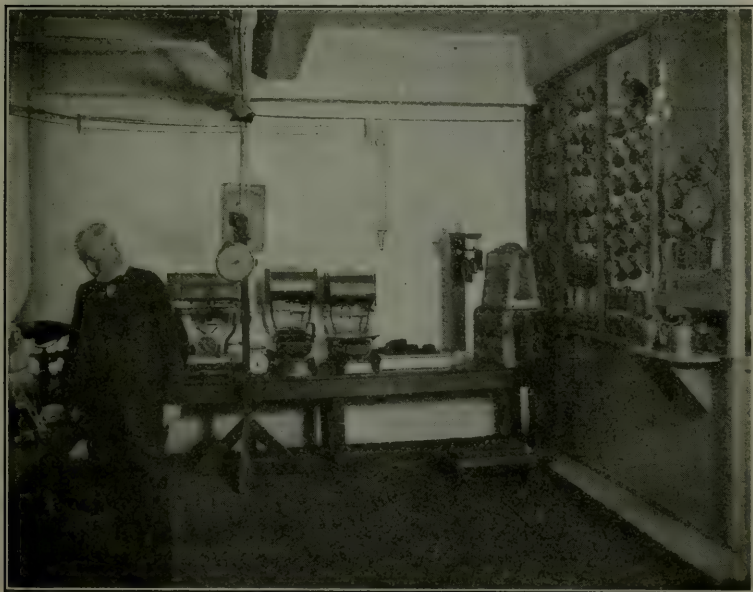
A scale is within tolerance if the maximum indicated error of weighing does not exceed 0.20 per cent of applied load.

"NET CONTAINER ACT."

No restrictive law has been put into operation along broader educational lines, or with greater consideration for commercial harmony, than has this law. While it has brought about a general compliance by persons whose commercial policies are based on the high principles of commercial honesty, there are those who disregard these policies thereby violating these commercial principles, which must be upheld by the rigid enforcement of this law.

All persons offering for sale food in containers are today equipped with accurate weighing and measuring devices by which to accurately estimate quantity, for which reason commercial misconduct in the sale of food products in containers is directly the result of carelessness, indifference, or the actual intention to commit fraud. When these circumstances have been found responsible for violation of this law, those guilty have been warned and prosecuted.

The merits of the Net Container Act have been thoroughly established. Its purpose, as a useful and beneficial force during the last three years is thoroughly confirmed. It is clearly comprehensive and constitutional, and we have regarded it our duty to give the people the protection and general benefits provided thereunder by a substantial and practical enforcement.



Office of John L. Gist, Sealer for Sonoma County.

"STANDARD WEIGHT FOR BREAD."

The amendment of 1917, to section 6 of the Weights and Measures Act, exempts from standardization any manufactured commodity consisting of four or more staple ingredients. The operation of this amendment takes from the superintendent the power of fixing a standard of weight for bread when baked in loaves and has seriously handicapped this department from protecting the public against short weight in the sale of this very common commodity. The fixing of a uniform standard of weight is the only practical manner in which the public can be protected against short weight and misconduct in the sale of bread, and it is the only manner in which the baking industry can be protected against erroneous and unfair competition.

In realization of the absolute necessity for uniform standard of weight for bread, I prepared a "bread ordinance" which I caused to be presented through the Weights and Measures Officials to the county legislative authorities for enactment. These ordinances were enacted in all the



Inspecting the weight of bread by San Francisco sealer.

large counties, large cities, and many towns throughout the state and have been effective in the uniform enforcement of a standard of weight for bread. The proposed form of ordinance follows:

Section 1. All loaves of bread made or procured for the purpose of sale, sold, offered or exposed for sale in the _____ shall weigh, six hours after

baking, not less than sixteen ounces avoirdupois, except as hereinafter provided, and such weight shall be the standard weight of a small loaf in the-----

Bread may also be made or procured for sale, sold or offered or exposed for sale in twenty-four ounce loaves, which shall be known as a standard large loaf; also, in multiples of the standards fixed for the small and large loaves and no other.

Commercial tolerances in excess are hereby fixed for small loaves of two ounces and for large loaves of three ounces, and there shall be no tolerance below or in deficiency of the fixed standard weight.

Bread commonly known as "twin loaves" or multiple loaves may be made or procured for the purpose of sale, sold, offered or exposed for sale, providing each unit of such "twin" or multiple loaf conforms to the standard weights as herein fixed. The commercial tolerance fixed for small loaf shall apply to each unit of the "twin" or multiple loaf.

Section 2. Any person, firm or corporation who shall make or procure for the purpose of sale, sell, offer or expose for sale within the-----
any bread in loaves otherwise than herein provided for or in conflict with the standard weights of bread when baked as herein fixed, shall be guilty of a misdemeanor.

All inspections of the weight of bread shall be made on the premises of the maker or manufacturer by averaging the weight of not less than twenty loaves of bread of any one unit and such average weight per loaf shall not be less than the minimum or more than the maximum weight herein fixed for such units.

Section 3. The provisions of this ordinance shall not apply to crackers, pretzels, biscuits, buns, scones, rolls or loaves of fancy bread weighing less than one-fourth of a pound avoirdupois or to what is commonly known as "stale bread," sold as such, provided the seller shall, at the time of sale, expressly state to the buyer that the bread so sold is stale bread.

This ordinance shall take effect at once and shall be enforced by the county sealer of weights and measures.



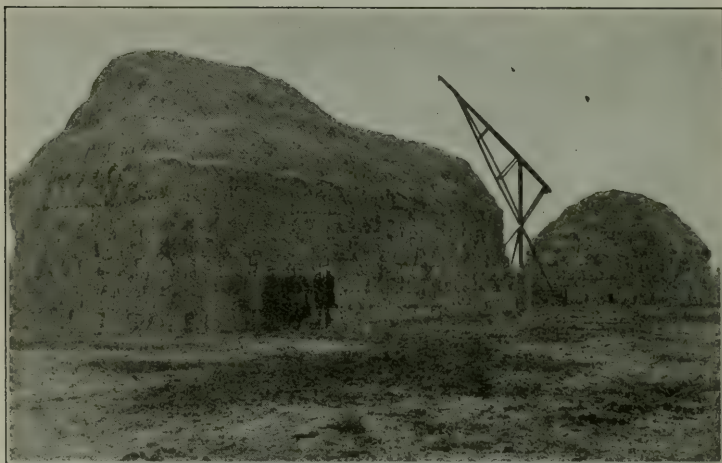
Evidence of a common violation of hay bill.

"HAY LAW."

The baled hay law has completely eliminated the old trade custom of tag weight and all its attending uncertainties of quantity by weight and has firmly fixed a definite weight value without equivocation or any reservation when sold on the premises, in transit, or at destination.

It has caused the balers of hay to employ scales that have been approved by a Sealer of Weights and Measures. This feature of the law demanding "inspection of scales" has been most effective in the elimination of inaccurate weighing apparatus.

The clause covering the fraud feature where heretofore foreign substances were concealed in the bales and which was a most irritating condition constantly arising in this department for possible adjustment concerning commodity weight value, has happily created a positive means of determining an accurate weight as well as establishing a quality value for a fixed sales price.



Inspection of above lot of hay disclosed a variance in weight of 99,190 pounds.
Inspection made by F. B. Johnson, Sealer for Fresno County.

Another most redeeming feature of this law is the protection afforded the producer or shipper against unjust commercial misconduct in the determination of loss due to broken bales of hay. This law demands that broken bales, as well as all sluffage of hay due to handling of the bales, must be taken into consideration as a part of the actual recorded total weight.

**FIXING A STANDARD OF WEIGHT FOR BERRIES WHEN SOLD IN
CONTAINERS, AND GENERAL INSTRUCTION RELATING
TO THEIR ENFORCEMENT.**

A careful survey of the basic as well as contributory elements relating to the production, packing and marketing of berries have been made for the purpose of fixing a uniform standard of weight for berries when sold, offered, or exposed for sale in containers.

All state, interstate and national laws and regulations having a bearing upon the standardization of quantity and quality of berries, when sold, offered or exposed for sale in containers, have been considered, for the purpose of avoiding conflict therewith, and careful consideration has been given to their constitutionality of the powers of this department to fix and enforce in the State of California a standard of weight for berries.

Section 6 of the Weights and Measures Act delegates to the State Superintendent of Weights and Measures the power to fix a standard net weight for berries and to prescribe such tolerances for same as he may in his best judgment deem necessary for the proper protection of the public.

The section providing these powers also provides for a penalty for violation of such standards and tolerances. In delegating these powers the legislature expresses unusual confidence and our exercise thereof should be only in the interest of good public policy and in the prevention of fraud, deception and misconduct, and in the protection of honest standards of industry and competition.

State and national authority have long since recognized the necessity for standardization of berry containers, and have wisely fixed by state law and national regulations, the standard pint (33.6 cubic inches) and the standard half-pint (16.8 cubic inches) as standard containers for berries.

Therefore, in the exercise of the powers conferred in Section 6 of the Weights and Measures Act, I hereby fix the following standards of weight for berries when sold, offered or exposed for sale in containers, and prescribe therefor the following tolerances, and any persons violating such standards or tolerances shall be guilty of a misdemeanor:

- Strawberries*—12 ounces minimum contents (pint 33.6 cubic inches). Tolerance $\frac{3}{4}$ ounces in deficiency; 2 ounces in excess.
- Loganberries*—12 ounces minimum contents (pint 33.6 cubic inches). Tolerance $\frac{3}{4}$ ounces in deficiency; 2 ounces in excess.
8 ounces minimum contents ($\frac{1}{2}$ pint 16.8 cubic inches). Tolerance $\frac{1}{2}$ ounce in deficiency; 1 ounce in excess.
- Blackberries*—12 ounces minimum contents (pint 33.6 cubic inches). Tolerance $\frac{3}{4}$ ounces in deficiency; 2 ounces in excess.
8 ounces minimum contents ($\frac{1}{2}$ pint 16.8 cubic inches). Tolerance $\frac{1}{2}$ ounces in deficiency; 1 ounce in excess.
- Raspberries* — 8 ounces minimum contents ($\frac{1}{2}$ pint 16.8 cubic inches). Tolerance $\frac{1}{2}$ ounces in deficiency; 1 ounce in excess.

Berries when sold, offered or exposed for sale in baskets in accordance with the standards herein fixed and packed in crates, chests, drawers, or other carriers, shall, for the purpose of effecting the practical operation of these standards, be considered as sub-containers, and such crates, chests, drawers, or other carriers, wherein such standard baskets are packed, shall be considered containers within the meaning of the Net Container Act, and shall declare thereon the number of baskets, together with the standard of weight for berries when packed in containers as herein fixed.

Berries of a different variety than those for which standards are herein fixed, when sold in containers, shall declare on such container, the true net weight of the contents thereof, as required by the Net Container Act.

NOTE:—For the purpose of inspection the following tare for berry baskets is recommended:

Pint baskets, $\frac{1}{2}$ ounce.

Half-pint baskets, $\frac{1}{3}$ ounce.

Half-pint baskets, tin top, $\frac{1}{2}$ ounce.

REGULATION RELATING TO LINSEED OIL AND TURPENTINE.

For many years it has been a trade custom to estimate quantity, in the sale of linseed oil and turpentine, by weight and expressing it in liquid measure. Seven and one-half pounds avoirdupois has been adopted as the equivalent of one standard gallon of linseed oil and seven pounds avoirdupois has been adopted as the equivalent of one standard gallon of turpentine.

These weight equivalents, of the standard gallon, are uniformly adopted and thoroughly understood by the paint and oil trade and are recognized in the specifications of purchase by national and state departments, and recommended by the American Society for Testing Materials. These equivalents are, therefore, considered commercial standards and are hereby approved and accepted by this department and may be operative in the sale of linseed oil and turpentine in quantities of five gallons or more.

These commercial standards or weight equivalents shall not, however, apply to the sale of these commodities in containers of less than five gallons and such containers shall declare the quantity which they contain in liquid capacity measure without weight equivalent and such declarations shall be a net statement of contents without any tolerance in deficiency of the United States standard liquid measure.

These commodities when sold in sealed containers in quantities of less than five gallons shall be in amounts equivalent to the standard gallon, its multiples or regular subdivisions i. e., half-gallon, quart, or pint and no other.



Public weighmaster scale installed by Kings County, and office of J. C. Griswold, Sealer for Kings County.

"REGULATIONS APPERTAINING TO CANVAS GOODS."

The development of the cotton industry necessitates the employment of canvas cotton picking sacks. These sacks are supplied to the producer by state and interstate manufacturers, who according to trade custom declare thereon the quality of the canvas on a weight basis, together with the length of the sack. Upon verification of these declarations, we found them to be false and misleading thereby facilitating the perpetration of misconduct and fraud.

Under our regulations of April 13, 1920, it is required that canvas when sold, offered or exposed for sale shall be measured by the standard linear yard, and that all canvas shall declare width and such declaration shall approximate the actual true width of the canvas. Further, that each cotton picking sack or bag shall be clearly stenciled, branded, or marked as to its true length, not including the material which constitutes the strap. The sacks shall be cut full length as indicated and shall so measure when finished, allowing for hemming only.

It was our purpose by these regulations to effect the common employment of the legal standard of measurement in the estimation of articles made from canvas, and any declaration or representation of measurement or weight in the sale of such articles which was found to be a false statement was construed as being a violation of the Weights and Measures laws. In effecting the operation of these regulations, we first obtained the cooperation of the manufacturers, both state and inter-

state, and instead of confusion, as was evident in the past, the public may today determine quantity in the purchase of canvas and articles made from canvas, without being familiar with the trade customs which in the past have mystified and confused.



Weighing baled cotton in the Imperial Valley.

STANDARD WEIGHT FOR ONIONS IN SACKS.

Section 6 of chapter 786, amended, Statutes of 1917, confers the power on the State Superintendent of Weights and Measures to establish a standard net weight of any commodity, produce or article, as he may in his best judgment deem necessary for the proper protection of the public, and fixes a penalty for the violation of such standards.

Acting in conformity with such powers, I hereby fix 100 pounds net weight as the minimum standard weight of a "sack of onions" and whenever onions are sold, offered or exposed for sale in the State of California, such sacks shall contain not less than 100 pounds net weight of onions, and whenever the term "sack of onions" is mentioned indicating quantity in the sale of onions, such term shall mean a quantity of onions not less than 100 pounds net weight and there shall be no tolerance allowed below this standard weight.

The fixing of this standard will effectively prevent the sale of onions under the designation of a "sack of onions" by persons who intentionally avail themselves of a common custom to perpetrate fraud and misconduct on the public and demoralize honest and legitimate competition.



Testing mammoth auto truck platform scale by M. W. Walker, Sealer for Santa Cruz County.

STANDARD WEIGHT FOR PEAS IN SACKS.

Whenever in the State of California green peas shall be sold, offered or exposed for sale in sacks, such sacks shall contain not less than sixty-eight pounds net weight of green peas, and whenever the term "sack of peas" is mentioned indicating quantity in the sale of green peas, such term shall mean a quantity of peas not less than sixty-eight pounds, net weight, and there shall be no tolerance allowed below this standard weight.

This minimum standard of weight shall not prevent the sale of green peas in sacks of a contents in excess of the standards herein fixed and whenever green peas are, so packed for sale, offered or exposed for sale at wholesale in containers in excess of the standards fixed, the quantity shall be determined by actual net weight and such net weight shall form the basis for settlement in the sale thereof.

Whenever green peas are sold in sacks at retail such sacks shall declare thereon a statement or declaration of the true net weight of the peas and such weight shall form the basis for settlement in the sale thereof. The standard weight of peas as herein fixed shall not be construed to conflict with the sale of green peas in any quantity at retail in which case quantity shall always be determined by avoirdupois net weight.

AMENDMENTS RECOMMENDED.

The Weights and Measures Act under Section 6 limits the power of the Superintendent to fix standards of weight and measure by exempting manufactured commodities consisting of four or more staple ingredients. This limitation was made by amendment in 1917 and intended to prohibit the fixing of a standard of weight for bread when baked in loaves. All opposition to the fixing of a bread standard has now been removed, and the proponents of the amendment and the baking industry throughout the State recommends and prays for the extension of the original powers to fix a standard weight for bread. I, therefore, earnestly recommend that the section be amended to read as originally passed.

The weights and measures laws provide general authority to supervise and regulate weights and measures throughout the State "where not otherwise provided by law." It is, therefore, not specific and limits the intended supervision and regulation to all weights and measures other than those owned and employed by public service corporations. I believe it was the intention of the framers of the law that its powers should be extended to include the supervision and regulation of all weights and measures irrespective of ownership or employment. Notwithstanding this limitation, your department has seriously concerned itself with the inspection, testing and installation of railroad track scales and other scales owned and employed by the carriers, and measuring devices owned and employed by other public utility corporations. This on the ground that it was in the best interest of public policy and by reason of the fact that your department was competent to do this work. I, therefore, recommend that section 9, of the Weights and Measures Act, be amended to make the law specific in its powers; and further, to provide for the annulment of any provisions of law enacted in conflict therewith.

Other amendments which I propose to introduce will be confined to clarifying the several weights and measures laws and making them more workable without adding any additional powers, or extending the service beyond its logical and definite sphere of activity.

"ARBITRATION AND PROSECUTION OF COMPLAINTS."

To this department has been delegated the authority to adjust the differences concerning variances of opinions relating to commercial transactions, wherein the weight value was in dispute. That principle of justice which has been the incentive and which has actuated the very conduct of this department in all its reciprocations with the varied businesses of our state, has won the confidence and respect of those engaged in large, as well as those in small, business affairs.

Your superintendent has conscientiously viewed all complaints and controversies with a disinterested mind, and procedure in every case has been determined upon the merits of each complaint.

Where warning or other lenient methods have failed to obtain compliance, complaints have been issued and prosecuted. Our reports show a very limited number of prosecutions. This for two reasons: Most complaints referred were due to misunderstanding and lack of motive. Careful investigations and a practical analysis of facts usually resulted in harmonious adjustments, and I have found this a wise procedure, as it saves that time of the officials for field work, which would otherwise be spent in court rooms.

All complaints wherein the violation was intentional, and where the act was harmful to any person, or to good public policy, such complaints have been vigorously prosecuted.

During the biennial period, I have had no knowledge of any act by any official in his concern with complaints, that in any manner reflected upon the dignity of the department, or which has impaired the usefulness of the service.



F. B. Johnson, Fresno County Sealer checking weight of two carloads of raisins valued at \$23,226.

APPARATUS INSPECTED, 1919.

County	Establishments visited	Certificates issued	Scales.				Spring			
			Sealed	Corrected	Out of order	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	7,794	7,794	1,744	1,079	205	84	1,331	757	213	36
Alpine	7	7	2	1			2	1		
Amador	75	68	19	3			10	2		
Butte	578	329	79	12	0	0	40	6	1	11
Calaveras	106	106	70	32			15			4
Colusa	239	236	61	1			26	1	1	
Contra Costa	9.3	12.7	170	31	5	1	109	25	16	11
Del Norte	33	23	15	9	1		1			1
El Dorado	50	50	23	4			7	2		
Fresno	2,634	2,832	980	251	37	5	396	124	48	53
Glenn	210	208	5	4	3		18	1	1	
Humboldt	401	401	98	78		1	43	30		5
Imperial	547	5.2	153	31	2	2	33	7		8
Inyo	125	107	36	21		2	11	1		5
Kern	825	621	144	41	11	3	97	27		16
Kings	511	510	83	24	4	2	22	4		6
Lake	105	106	33	1			8	1	1	
Lassen	88	88	31	22		1	1	1	1	1
Los Angeles	8,300	10,155	2,110	1,093	203	95	3,740	2,473	101	646
Madera	245	245	32	10	4		13	10	1	4
Marin	1,322	713	142	51	6		139	46		16
Mariposa	27	27	12	2			3			1
Mendocino	215	215	154	11	2	3	86	3		17
Merced	292	292	52	15	8	3	15			
Modoc	97	97	35	13		1	2	2		3
Mono	18	18	14	7			8	4		
Monterey	569	416	59	19			42	18		13
Napa	106	166	55	16			27	12		14
Nevada	133	133	0	9			26	9	1	4
Orange	1,011	1,011	127	35	6	10	92	18	1	18
Placer	262	262	35	27		2	6	2	1	2
Plumas	64	64	23	5		1	3			
Riverside	676	656	97	84	1	1	79	53	5	17
Sacramento	2,023	1,320	504	145	46	78	40	101	44	48
San Benito	39	39	3				4			
San Bernardino	1,072	667	127	7		1	53	6		7
San Diego	3,963	2,506	712	195	24	12	1,120	75	9	36
San Francisco	11,321	9,788	2,721	674	115	56	2,917	597	351	115
San Joaquin	1,639	1,092	218	18	6	3	125	6	9	40
San Luis Obispo	609	609	145	76	2	1	91	46		8
San Mateo	2,126	1,427	377	146	11	8	12	63	29	12
Santa Barbara	882	634	205	64		2	76	23	1	12
Santa Clara	540	520	131	44	6	1	68	51	4	1
Santa Cruz	1,846	1,215	226	108	32	11	162	87	41	35
Shasta	337	312	157	55		6	91	15		5
Sierra	31	31	15	3						3
Siskiyou	352	352	176	6	5	4	9	2		4
Solano	936	500	122	6	1		61	6	1	5
Sonoma	867	867	330	14	5	1	99	3	1	2
Stanislaus	1,593	1,318	571	50	3	2	254	17	23	84
Sutter	139	139	7	3	1	0	4	0	0	0
Tehama	320	322	131	14	10	2	9	1	8	1
Trinity	41	41	25	8		1	2	4		2
Tulare	605	605	185	62	11	2	53	32	4	1
Tuolumne	138	133	43	26			14	4	2	5
Ventura	1,615	584	159	7			109	30	5	1
Yolo	465	466	74	15			40	2		3
Yuba	192	186	29	38		1	26	7		14

APPARATUS INSPECTED, 1919.

Scales.

County	Computing				Platform			
	Sealed.	Corrected.	Out of order.	Condemned and confiscated.	Sealed.	Corrected.	Out of order.	Condemned and confiscated.
Alameda	3,351	2,077	543	8	2,250	1,413	428	30
Alpine	7	1			4	3		
Amador	42	23			44	15		
Butte	90	0	0	0	251	124	13	0
Calaveras	36	12	1		76	42	1	
Colusa	55	11	1		164	34	8	
Contra Costa	277	88	43	2	556	249	70	3
Del Norte	12	4	2		6	17		
El Dorado	33	20			28	10		
Fresno	943	344	144	3	1,204	773	193	30
Glenn	62	16			120	50	6	
Humboldt	263	151		4	289	200		11
Imperial	192	74	9		170	61	7	4
Inyo	57	27			65	50		3
Ken	354	87	21	4	410	90	42	
Kings	51	19	3		212	66	21	1
Lake	25	2	1		44	12	3	
Lassen	14	15		2	13	49		3
Los Angeles	2,904	2,300	391	27	2,009	2,039	180	47
Madra	38	33	4	1	118	16	24	2
Marin	306	122	24		258	86	9	2
Mariposa	9	3			9	3	1	
Mendocino	166	16	2		200	18	2	2
Merced	33	17	4		151	57	42	
Modoc	11	13			47	32	2	
Mono	4	3			18	14		
Monterey	164	72	16		415	285	34	3
Napa	111	60		1	103	41		
Nevada	70	40			73	16	2	
Orange	616	334	40	5	567	309	19	18
Placer	71	47	5		114	53	3	
Plumas	13	16			58	10		2
Riverside	159	146	6		218	297	12	10
Sacramento	644	561	63	4	875	385	190	70
San Benito	13				5	2		
San Bernardino	421	38			253	91		
San Diego	1,106	491	127	10	878	380	72	14
San Francisco	3,308	535	350	32	2,733	558	476	22
San Joaquin	385	79	22	4	567	130	70	13
San Luis Obispo	161	99	2	2	301	178	7	13
San Mateo	663	368	46	2	659	547	104	1
Santa Barbara	171	61	1	2	216	183	4	9
Santa Clara	289	85	70		257	273	33	
Santa Cruz	298	174	55	4	515	327	131	11
Shasta	88	25			214	107	4	4
Sierra	8	5			14	2		1
Siskiyou	15	5	4		203	54	17	
Solano	162	34	18		180	71	20	
Sonoma	378	44	5		718	104	15	11
Stanislaus	418	139	9	1	807	285	34	13
Sutter	15	4	0	0	7	120	20	1
Tehama	56	12	3		202	41	27	1
Trinity	8	5	1		12	17	2	
Tulare	278	50	9		489	183	12	
Tuolumne	17	25	1		63	53	2	
Ventura	146	51	2	1	349	127	16	5
Yolo	122	4	3		341	28	9	1
Yuba	24	27	5		86	34	6	2

APPARATUS INSPECTED, 1919.

County	Weights				Measures, linear			
	Scaled	Corrected	Out of order	Confined and confiscated	Scaled	Corrected	Out of order	Confined and confiscated
Alameda	15,600	4,273	278	596	75	19		
Alpine	17		2	2	1			
Amador	232	2		2	6			
Butte	988	63	0	10	0	0	0	0
Calaveras	433	74		8	5			
Colusa	809	24		6				
Contra Costa	3,515	300	14	19	74	2	2	
Del Norte	159	2		3	2			
El Dorado	178	2		9	12			
Fresno	5,723	251	61	27	26			
Glenn	539	22		8				
Humboldt	1,303	179		51	204			
Imperial	1,018	31		27	69			5
Inyo	305	134		25	7	5		
Kern	204	121		1				
Kings	523	66		17				
Lake	312	3						
Lassen	235	67		11	13			
Los Angeles	33,423	1,019	7	1,650	796	8		147
Madera	583	49		50	7			
Marin	1,431	112		18	16			7
Mariposa	43	4						
Mendocino	816	25		26	53	2		2
Merced	704	46		80	1			
Modoc	303	39		13	9			
Mono	103	18		10				
Monterey	1,512	7		15	1			
Napa	591	13		4	31			
Nevada	454	1		1	71			
Orange	1,02	84		48	38			
Placer	715	34		14	5	2		2
Plumas	203	10		1	8	1		
Riverside	1,318	131		7	10			
Sacramento	5,119	433	22	220	14	18	2	24
San Benito	17							
San Bernardino	1,430				238			
San Diego	8,144	29		68	123			
San Francisco	15,747	86		67	8,073			
San Joaquin	2,940	35		62	54			1
San Luis Obispo	1,311	91		17				
San Mateo	4,655	1,310		35	61			
Santa Barbara	2,350	77		10	244	2		1
Santa Clara	1,559	170		11				
Santa Cruz	2,132	381		54				
Shasta	1,390	20		14	10			
Sierra	68	12			8	1		
Siskiyou	1,307	23		45	1			
Solano	1,073			45	1			3
Sonoma	3,744	12		18	56			
Stanislaus	4,914	65	243	120	7			2
Sutter	238	34	0	1	10	0	0	0
Tehama	1,174	148	4	36				
Trinity	182	15		10	3			
Tulare	2,592			29				
Tuolumne	319	51		9				
Ventura	2,183	28	3	40	15			
Yolo	1,700	10		1	6			
Yuba	588	12		18	21	40	7	48

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County	Measures, liquid				Measuring pumps			
	Sealed	Corrected	Out of order	Condemed and confiscated	Sealed	Corrected	Out of order	Condemed and confiscated
Alameda	3,684	341	197	359	1,207	632	266	10
Alpine	5			1	2	2		
Amador	41			1	32	11		
Butte	93	0	0	1	94	23	1	0
Calaveras	295			3	26	17	4	
Colusa	322		1		67	41	6	
Contra Costa	577	23	16	15	106	97	22	
Del Norte	17	10		5	11	8		
El Dorado	23			1	26	11	1	
Fresno	1,643	115	24	57	730	311	138	
Glenn	278	9		4	81	42	10	
Humboldt	951			7	131	102		
Imperial	628	26	29	56	129	53	3	
Inyo	19			6	34	18	4	
Kern	390	1		23	317	76	7	
Kings	28	1	1	6	118	52	13	
Lake	96				34	13	2	
Lassen	194	21		6	7	14	3	
Los Angeles	14,778	124	2	149	943	630	251	
Madera	327	50	5	45	77	23	24	
Marin	743			31	381	167	25	2
Mariposa	17	2	1	1	20	7	3	
Mendocino	252			17	118	32	3	
Merced	91	20	15	9	95	39	15	
Modoc	64	7		7	17	15	1	
Mono	25				4	3		
Monterey	161	8	4	6	111	48	11	
Napa	90			3	61	27	5	
Nevada	98				28	16	1	
Orange	40		44	26	277	116	33	
Placer	408	3	1	65	66	55	8	
Plumas	27				17	4		
Riverside	267	35	5	10	215	163	6	
Sacramento	3,534	133	691	1,023	201	91	69	32
San Benito	2	1			7	2		
San Bernardino	866			1	250	10	1	1
San Diego	7,810	45		325	543	229	43	
San Francisco	7,281	49	2,494	2,883	927	8	275	1
San Joaquin	1,638	4	12	31	260	121	16	2
San Luis Obispo	351			24	153	78	2	6
San Mateo	1,665			28	840	247	76	
Santa Barbara	900			17	188	106		
Santa Clara	275			13	155	61	13	
Santa Cruz	777	29	134	100	232	158	48	
Shasta	541	1		7	83	15	3	
Sierra	31	1		2	8	3		
Siskiyou	125	1		6	48	37	2	
Solano	119		1	10	43	24	14	
Sonoma	283				198	33	2	
Stanislaus	893	17	6	171	380	99	43	6
Sutter	0	0	0	0	5	4	1	0
Tehama	386	11	1	21	74	52	12	
Trinity	27	10		4	2	5		
Tulare	1,216		27	27	318	60	4	
Tuolumne	261	2	2	5	31	19	3	
Ventura	1,279			5	176	65	15	
Yolo	239			1	116	19	3	
Yuba	246	23	31	12	21	8	10	

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County	Milk bottles				Miscellaneous			
	Inspected	Minus	Plus	Contaminated and confiscated	Sealed	Corrected	Out of order	Contaminated and confiscated
Alameda	639,831			2,253	64	43	15	
Alpine					1	1		
Amador								
Butte	1,879	0	0	0	0	0	0	0
Calaveras								
Colusa	144	72	72					
Contra Costa	3,456		1,728		35	21	7	
Del Norte								
El Dorado								
Fresno	48,335			10,400	59	32	8	6
Glenn								
Humboldt	2,622							
Imperial	95	77	44					
Inyo								
Kern	195	4	10					
Kings								
Lake								
Lassen	648			56				
Los Angeles	1,731,319			9,936	172	132	13	
Madera								
Marin	89,525			305	85	40	2	
Mariposa	265							
Mendocino	133							
Merced					4	4		
Modoc					82			
Mono								
Monterey	2,724			144				
Napa	1,000							
Nevada					880	111	4	6
Orange	28,776				95	53	16	
Placer	1,068	14		14	14			
Plumas								
Riverside	1,296							
Sacramento	16,832	22		22				
San Benito					10			
San Bernardino	37,100							
San Diego	317,737	118,072	199,635	5,184	20	1	1	
San Francisco	1,464,741			43,154				
San Joaquin	17,448			3	26			
San Luis Obispo	4,878	45		45	48	26	11	
San Mateo	71,354			720				
Santa Barbara	17,100						2	
Santa Clara	12,000			2	21	697	290	
Santa Cruz	8,554			87	41	1	5	
Shasta	1,209							
Sierra								
Siskiyou	60	23	28	9	16	1	2	2
Solano					39	23	3	
Sonoma	1,270							
Stanislaus	10,676	3,970	6,262	20	21	109	67	6
Sutter	0	0	0	0	0	0	0	0
Tehama	608	70	538					
Trinity					7	2		
Tulare					419			
Tuolumne	116							
Ventura	2,150							
Yolo	3,000				14			
Yuba	102	13	12		29	7		

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County	Containers or packages inspected			Complaints				
	Heavy	Correct	Light	Prosecutions	Convictions	Acquittals	Cases pending	Otherwise disposed of
Alameda	25,508	161,317	16,357	3	3		1	1,250
Alpine	180	612	7					
Amador		705	10					
Butte	190	1,718	258	0	0	0	1	32
Calaveras	17	5,950	242					
Colusa	45	1,007	222					
Contra Costa	157	360	100	2	2			81
Del Norte	10	187	20					
El Dorado		410						
Fresno	8,642	163,811	2,192	8	7	1		105
Glenn	56	787	78					
Humboldt	152	8,994						
Imperial	255	3,060	133					17
Inyo	4	5,509	79					
Kern	58	770	452	2	2			
Kings		45,470	378	2	1	1		
Lake	20	937	69					
Lassen	95	2,568	352					
Los Angeles	2,416	8,497	13,123	145	137	8		
Madera	174	757	70					
Marin		72,200	1,266					18
Mariposa		34						
Mendocino	100	512	48					
Merced	94	361	19					
Modoc	131	2,566	176					
Mono	2	2,878	15					
Monterey	1	19,083	287	1	1			
Napa	572	3,105	4					1
Nevada	297	3,612	90					2
Orange		430	1,387	5	5			2
Placer	875	25,178	475					
Plumas	4	66	2					
Riverside		579	703	1		1	1	6
Sacramento	3,633	32,377	31,591	3	3			
San Benito	182	455	19					
San Bernardino		52,875	955	3	3			
San Diego	4,147	79,510	11,858	5	4	1	6	62
San Francisco	5,046	196,253	15,683	91	8			
San Joaquin	31	5,979	181					
San Luis Obispo		4,919	62					25
San Mateo		614,179	25	1	1			
Santa Barbara	415	2,835	4,208	1	1		1	196
Santa Clara	19	58	19,001					
Santa Cruz	404	2,733	1,203					94
Shasta	11	894	112					
Sierra								
Siskiyou	43	3	68	2			2	
Solano	119	1,210	133	1	1			
Sonoma	273	4,893	60	1	1			
Stanislaus	1,255	11,866	10,012					19
Sutter	40	0	0	0	0	0	0	0
Tehama	65	1,277	98	1		1		
Trinity	40	202	9					
Tulare		1,197						
Tuolumne	7	6,340	75					
Ventura	330	2,284	461					49
Yolo		3,586	50					
Yuba	244	1,538	143					

APPARATUS INSPECTED, 1920.

Scales.

County	Establishments visited	Certificates issued	Counter				Spring			
			Sealed	Corrected	Out of order	Contempted and confiscated	Sealed	Corrected	Out of order	Contempted and confiscated
Alameda	6,797	6,797	353	1,178	103	30	508	986	152	35
Alpine	7	7	2	1			2	1		
Amador	77	77	19	5			8	5		
Butte	1,414	1,414	156	26	1	1	88	4	0	4
Calaveras	107	102	64	21	1	1	14		1	3
Colusa	240	219	60	8	2		25	3		1
Contra Costa	582	1,033	157	28	17	0	98	31	53	3
Del Norte	49	49	9	5			1	1		
El Dorado	76	68	46	13			17	2		
Fresno	3,612	3,792	377	77	28	1	413	58	55	25
Glenn	20	208	35			1	17	1	1	
Humboldt	22	292	61	42		1	52	30		1
Imperial	566	538	79	10	1	6	39	3		8
Inyo	94	88	40	19			7	1		
Kern	1,153	1,601	57	11	2	1	129	23	7	21
Kings	58	152	18	21	6	2	26	4	3	5
Lake	88	88	44	2	2	1	3	2		
Lassen	116	116	29	4	1	2	7			1
Los Angeles	7,730	10,571	1,198	303	76	53	3,585	2,581	116	1,349
Madera	245	245	28	3	3	8	15			4
Marin	1,049	651	183	46	3		153	6	2	7
Mariposa	42	42	19	4	3		2	1		2
Mendocino	412	409	121	11	3	2	93	4	0	10
Merced	301	301	28	4	11	3	10		2	3
Modoc	114	114	17	3			3			
Mono	18	18	18	3			3	2		1
Monterey	623	623	302	199	21	3	73	20	8	7
Napa	170	170	57	15			12	4	2	1
Nevada	114	114	45	5			15	8		
Orange	884	884	89	39	11	5	118	32	7	22
Placer	651	646	56	61	1	1	16	11	3	3
Plumas	77	77	2				2			
Riverside	839	738	74	12	2	1	79	65	1	7
Sacramento	1,516	1,514	1,099	446	560	63	457	116	30	27
San Benito	65	63	24	9	0	0	21	1	0	1
San Bernardino	677	515	105	13	6		63	2	1	2
San Diego	2,570	1,851	590	159	41	15	954	47	50	47
San Francisco	10,025	8,899	2,931	694	166	7	3,157	391	231	39
San Joaquin	1,565	1,278	166	28	6	2	105	31	27	19
San Luis Obispo	561	550	144	42	0	3	79	29	0	6
San Mateo	1,827	1,221	331	151	5		139	100	30	11
Santa Barbara	873	717	237	60	2	3	93	28		14
Santa Clara	561	650	112	76	5	1	90	8	2	3
Santa Cruz	2,423	1,475	233	143	22	14	242	124	21	28
Shasta	327	275	125	57	2	3	71	10		
Sierra	17	17	6				1			
Siskiyou	369	369	204	12	1	2	12			4
Solano	211	157	18	5	1		41	14	7	1
Sonoma	861	861	321	12	5	1	66	3	1	4
Stanislaus	1,282	1,115	618	83	8	7	196	14	5	68
Sutter	278	266	33	6		6	3			6
Tehama	241	226	105		5	1	11		1	
Trinity	21	21	12	2			2			0
Tulare	234	237	56	16	4	0	7	0	2	0
Tuolumne	148	115	58	16			11			2
Ventura	1,147	618	133	29	1	1	87	40	0	59
Yolo	144	183	46	7		1	15	1	2	2
Yuba	338	332	55	7	2	3	88	2	2	14

APPARATUS INSPECTED, 1920.

Scales.

County	Computing				Platform			
	Sealed.	Corrected.	Out of order.	Confined and confiscated.	Sealed.	Corrected.	Out of order.	Confined and confiscated.
Alameda	866	1,979	311	8	325	2,339	418	22
Alpine	2	1			4	3		
Amador	50	21	1		44	17	2	
Butte	443	100	5	0	195	183	0	9
Calaveras	39	17			70	33	3	
Colusa	62	15	2		136	18	8	1
Contra Costa	331	117	76	0	391	177	54	0
Del Norte	20	6			37	11		
El Dorado	42	14			53	30		
Fresno	1,210	333	115	7	1,111	129	2.0	4
Glenn	73	20	1		103	12	6	
Humboldt	169	115		3	264	118		1
Imperial	136	103	5	2	128	78	17	6
Inyo	45	22	2		52	30	4	
Kern	4.6	166	57	2	469	183	50	2
Kings	91	29	6		197	78	30	1
Lake	43	7			16	6		
Lassen	14	14		1	45	12	4	1
Los Angeles	3,183	2,043	527	47	2,017	1,9.0	430	50
Madera	44	11	4		143	24	28	9
Marin	210	63	3		233	84	9	
Mariposa	13	5	1	1	15	7	3	
Mendocino	193	4	1	2	205	18	1	5
Merced	27	11	1		105	49	56	2
Modoc	19	9			31	20	1	1
Mono	7	4			19	11	1	
Monterey	271	89	13	1	431	176	43	
Napa	105	52	2		123	53	2	1
Nevada	62	25	1		63	22	2	
Orange	595	336	29	1	567	370	29	16
Placer	59	125	5	0	91	197	2	1
Plumas	19	14			43	12	2	1
Riverside	190	184	6	3	183	281	23	6
Sacramento	598	206	59	9	720	389	132	9
San Benito	40	8	1	0	124	4	2	1
San Bernardino	193	70	14		248	42	26	1
San Diego	872	273	61	13	682	183	55	13
San Francisco	3,256	900	328	8	2,549	804	470	9
San Joaquin	278	174	13	5	417	141	59	34
San Luis Obispo	165	67	0	2	311	116	0	4
San Mateo	524	479	59	1	743	702	84	2
Santa Barbara	254	96			183	223	11	3
Santa Clara	309	170	33		230	271	21	
Santa Cruz	323	242	45	2	464	365	74	3
Shasta	83	19			195	118	2	2
Sierra	18	9			12	2		
Siskiyou	76	10	6		163	53	5	1
Solano	76	51	15		88	8	2	
Sonoma	409	31	6	2	680	77	5	1
Stanislaus	283	113	4	1	720	270	32	5
Sutter	29	3			368	269	31	6
Tehama	66	14	1		141	18	11	
Trinity	17	8			13	2		
Tulare	102	40	3	0	209	89	13	1
Tuolumne	46	21	1		57	29	3	
Ventura	152	88	11	0	355	138	22	6
Yolo	76	5	3		97	21	8	
Yuba	82	26	5		115	49	8	2

APPARATUS INSPECTED, 1920.

County	Weights				Measures, linear			
	Scaled	Corrected	Out of order	Condemned and confiscated	Scaled	Corrected	Out of order	Condemned and confiscated
Alameda	11,423	3,146	183	967	95	87	21	1
Alpine	17		2	2	1			
Amador	289	4			7			
Butte	1,200	117	0	17	60	0	0	0
Calaveras	404	32		17	10	3		
Colusa	592	15			1			
Contra Costa	2,384	187	46	57	39	4	0	0
Del Norte	154	2			100	3		
El Dorado	214	35			20	8		
Fresno	7,376	364	97	265	4			
Glenn	465	20		3	3			
Humboldt	1,080	120		6	198	3		
Imperial	1,255	77		46	79			40
Inyo	295	46		8	12			
Kern	327	18	1	2				
Kings	889	55		24	3			
Lake	20			6				
Lassen	361	22		9	12			32
Los Angeles	22,110	424	133	557	526	2	12	100
Madera	593	35		47	2		3	
Marin	1,893	6		8	35			
Mariposa	94	5		7				
Mendocino	598	20	0	31	43	0	0	0
Merced	514	11		29	1	1		
Modoc	290	2		35	22			4
Mono	103	16		1	4			
Monterey	1,878	163		98	62	2		
Napa	620	7		7	56			
Nevada	473				16			
Orange	1,405	60		4				
Placer	1,332	22	0	10	7		0	
Plumas	319	6			17			17
Riverside	1,115	56		16	22			
Sacramento	4,825	563	0	374	89	5	0	5
San Benito	511	12	0	37	35	0	0	2
San Bernardino	765	1		7				
San Diego	6,102	88	0	128	426	27	0	5
San Francisco	19,479	771	1,008		4,005		149	
San Joaquin	2,942	53		123	166			28
San Luis Obispo	1,074	11	0	31	0	0	0	0
San Mateo	4,974	1,711			49			
Santa Barbara	2,486	103		1	239	6		
Santa Clara	1,199	122		7				
Santa Cruz	2,378	10		32	5	1		
Shasta	1,200	23		4	38			
Sierra	67				2			
Siskiyou	1,476	18		48	15			
Solano	208							
Sonoma	3,535	6		9	16			
Stanislaus	4,681	52	166	88	9			
Sutter	1,279	113		40				
Tehama	733	31			12			
Trinity	81	1			5			
Tulare	977	2	0	16	0	0	1	1
Tuolumne	301	24			9	6		
Ventura	2,390	27	0	61	31	0	1	5
Yolo	609	10		9				
Yuba	804	50		38				

APPARATUS INSPECTED, 1920.

County	Measures, liquid				Measuring pumps			
	Sealed	Corrected	Out of order	Confiscated and condemned	Sealed	Corrected	Out of order	Confiscated and condemned
Alameda	2,135	280	70	61	888	895	316	12
Alpine	5			1	2	2		
Amador	63			1	33	12		
Butte	167	0	0	18	183	31	0	0
Calaveras	167			6	20	0	4	
Colusa	256	13	1	2	48	32	8	
Contra Costa	474	27	10	10	111	85	37	0
Del Norte	114	5			15	6		
El Dorado	158				29	15	1	
Fresno	606	129	3	2	1,443	424	167	
Glenn	213	7		10	86	52	15	
Humboldt	706	2		2	164	41		
Imperial	543	32		75	145	52	20	
Inyo	122		1	3	24	15		
Kern	568			2	31	121	1	
Kings	211	2		50	111	47		
Lake	10				20	3		
Lassen	97			5	31	8	4	
Los Angeles	9,071	137	44	131	968	944	334	
Madera	292	21	17	21	72	17	15	
Marin	764			3	213	23	14	
Mariposa	30	3	4	5	18	9	5	
Mendocino	242	0	0	4	137	13		1
Merced	51	11		2	67	32	9	
Modoc	95			7	30	5	1	
Mono	27				6			
Monterey	422	27		14	261	132	20	
Napa	103			8	82	35	4	
Nevada	61				30	15	2	1
Orange	79	3	1		271	80	33	2
Placer	750	43	19	87	121	121	11	0
Plumas	42			10	16	3		
Riverside	434	76		12	258	183	8	
Sacramento	3,207	135	0	1,715	139	86	23	2
San Benito	62	4	0	8	37	13	0	0
San Bernardino	301			8	112	59	10	
San Diego	7,163	60	0	277	882	195	38	0
San Francisco	4,831	121	373	22	684	72	177	
San Joaquin	1,350	2	1	10	504	92	12	4
San Luis Obispo	280	0	0	31	162	45	0	0
San Mateo	1,479		4	4	933	344	90	
Santa Barbara	1,077			9	226	101	1	1
Santa Clara	40	5		6	150	72	13	
Santa Cruz	1,004	46		110	280	173	85	1
Shasta	723	1		5	92	11	2	
Sierra	26				3	2		
Siskiyou	174	1		26	76	31		
Solano	41			3	13	10	2	
Sonoma	267			1	235	47	2	
Stanislaus	636	14		126	399	100	28	5
Sutter	40			4	23	5	6	
Tehama	167			1	62	33	12	
Trinity	24			4	7	2	1	
Tulare	386	14	27	6	120	55	4	0
Tuolumne	149			4	26	15		
Ventura	1,248	0	0	31	254	68	17	0
Yolo	87	1		5	35	3	4	
Yuba	95	3	1	6	60	22	2	

APPARATUS INSPECTED, 1920.

County	Milk bottles				Miscellaneous			
	Inspected	Minus	Plus	Condemned and confiscated	Sealed	Corrected	Out of order	Condemned and confiscated
Alameda	337,704	0	0	2,784	6	28	3	0
Alpine					1	1		
Amador								
Butte	495	15	160	30	3,060	0	0	10
Calaveras								
Colusa								
Contra Costa	984	63	46	0	38	6	8	0
Del Norte								
El Dorado								
Fresno					660	40	22	22
Genn								
Humboldt	952	12		12				
Imperial	180	7	3	7				
Inyo								
Kern	1,100							
Kings	6,120							
Lake								
Lassen	500							
Los Angeles	2,151,784			21,860	591	312	19	341
Madera	200				2			
Marin	62,407			93	27	6		
Mariposa								
Mendocino	135	0	0	0	192	0	0	0
Merced					71	24	33	
Modoc								
Mono								
Monterey	2,320				13	3	2	
Napa	3,000							
Nevada								
Orange	999	24						
Placer	1,215	9	0	0	0	0	0	0
Plumas								
Riverside	78	17		17	19	19		
Sacramento	8,000	0	0	0	41	25	9	1
San Benito	100	0	0	0	0	0	0	0
San Bernardino	6,278			1	31	1		
San Diego	198,153	82,239	116,916	0	8	0	0	0
San Francisco	3,724,771							
San Joaquin	28				729	86	43	67
San Luis Obispo	3,768	0	0	0	114	48	0	0
San Mateo	16,270							
Santa Barbara	24,900				392	10		
Santa Clara								
Santa Cruz	2,337			2	178	96	45	
Shasta	1,060	8	24					
Sierra								
Siskiyou	120	53	68	20	87	42	15	2
Solano					3		1	
Sonoma	435							
Stanislaus	1				541	108	57	20
Sutter								
Tehama		144						
Trinity								
Tulare	0	0	0	0	0	0	0	0
Tuolumne	106							
Ventura	2,950	0	0	0	0	0	0	0
Yolo					63	1	2	
Yuba	2,020	120	1,600	80	3		1	

APPARATUS INSPECTED, 1920.

County	Containers or packages inspected			Complaints				
	Heavy	Correct	Light	Prosecutions	Convictions	Acquittals	Cases pending	Otherwise disposed of
Alameda	111,641	118,682	25,143	8	7	0	0	1
Alpine	190	612	7					
Amador		1,159	5					
Butte	347	1,599	734	1	1	0	0	0
Calaveras		4,025	512					
Colusa	10	834	20					
Contra Costa	305	1,157	119	0	0	0	0	39
Del Norte	75	1,755						
El Dorado		1,823	291					
Fresno	1,396	145,099	3,906	9	6	2	1	143
Glenn	20	837	42					
Humboldt	104	7,209	5					
Imperial	20	1,028	1,072					
Inyo		3,638	562					
Kern	438	5,884	2,931	6	6			
Kings	100	9,834	4,266	4	4			114
Lake		140	5					
Lassen	30	170	6					
Los Angeles	2,395	7,454	5,050	99	94	3	2	
Madera		6,135						
Marin		48,914	515					
Mariposa		15						
Mendocino	13	684	20	0	0	0	0	0
Merced	78	559	700				1	12
Modoc	32	413	248					
Mono								
Monterey		25,710	16,350					
Napa	25	2,243	599					1
Nevada	30	2,120	54					
Orange	20	110	622	4	4			
Placer	1,906	67,392	933	2	2	0	0	0
Plumas	7	258	4					
Riverside	1,433	3,671	1,854	5	4	1		
Sacramento	2,033	25,149	17,195	1	1	0	8	67
San Benito	6	105	13	0	0	0	0	0
San Bernardino	30	2,983	151	1	1			
San Diego	3,676	38,167	5,639	9	8	1	0	127
San Francisco	5,040	52,822	66,227	8	7	1		
San Joaquin	637	10,908	3,630	5	4	1		
San Luis Obispo	0	7,741	0	0	0	0	0	0
San Mateo		402,484						
Santa Barbara		3,935	2,000	5	5			
Santa Clara		370	131,087					
Santa Cruz	1,315	10,619	2,831					44
Shasta	103	993	189					
Sierra	22	450	16					
Siskiyou	157	222	476					
Solano	5	36	3					
Sonoma		616	55				1	
Stanislaus	1,406	8,387	3,309	1	1			12
Sutter	750	1,100						
Tehama	45	1,942	82					
Trinity		234						
Tulare	0	820	269	0	0	0	0	1
Tuolumne		1,309	259	1		1		
Ventura	280	2,423	136	0	0	0	8	27
Yolo		3,365						
Yuba	314	5,619	1,390	3	2	1	2	

COMPILATION OF INSPECTIONS, 1919 and 1920.

	1919	1920
Establishments visited	61,820	58,036
Certificates issued	55,268	55,603
Scales inspected	76,795	68,302
Scales corrected	29,323	29,423
Scales condemned for repair	6,279	6,330
Scales confiscated	2,201	2,507
Scales sealed	68,315	59,465
Miscellaneous inspections	2,868	7,615
Measures inspected	77,274	54,116
Measures corrected	1,214	1,386
Measures condemned for repair	3,753	764
Measures confiscated	5,378	3,182
Measures sealed	68,113	50,170
Weights inspected	147,432	132,250
Weights corrected	10,287	8,927
Weights condemned for repair	634	1,631
Weights confiscated	4,229	3,320
Weights sealed	142,569	127,308
Measuring pumps inspected	12,444	13,133
Measuring pumps corrected	4,440	5,095
Measuring pumps condemned for repair	1,529	1,693
Measuring pumps confiscated	60	29
Measuring pumps sealed	10,855	11,411
Milk bottles inspected	7,348,290	6,569,380
Milk bottles correct	6,945,037	6,342,925
Milk bottles confiscated	72,514	24,926
Containers inspected	1,768,465	1,488,627
Containers heavy	56,362	133,389
Containers correct	1,575,173	1,050,020
Containers light	136,930	302,208
Prosecutions	278	172
Convictions	180	157
Acquittals	13	12
Pending	12	23
Complaints otherwise disposed of	1,959	1,588

"THE PUBLIC WEIGHMASTER ACT."

The Public Weighmaster Act as approved June 8, 1915, and amended in 1919, has thoroughly proven its usefulness in the channels of commercial activities.

Eighteen hundred and fourteen persons, firms and corporations have qualified as Public Weighmasters, and the Department today holds one million eight hundred and fourteen thousand dollars in bonds, guaranteeing honest weights, and the proper employment of weighing devices by these persons, firms and corporations.

A remarkable change as the result of the operation of this law has expressed itself in the character of apparatus, the manner in which it is installed, and the concern by owners and operators in its upkeep. These elements have a stable and far reaching influence towards accuracy.

In testimony of the practicability of this law, and its enforcement, the officials of the National Government found the intentions and purposes of the National Warehousing Act operative in California under the Public Weighmaster Act. This condition prevailed before the enactment of the national law.

Apparatus employed by public weighmasters are inspected semi-annually and upon request, and we require a full compliance with departmental specifications regulating all new installations.



A public weighmaster's scale properly installed and housed.

The use of the auto truck in hauling heavy loads has proven the necessity for proper installation of large platform scales. The principle of accuracy is of paramount importance, and to safeguard it, old and poorly installed scales are rapidly being rebuilt and set on good foundations, and much is being replaced by new and more satisfactory types, properly installed and protected against the elements.

STATE OF CALIFORNIA			
Public Weigh Master's Certificate of Weight and Measure			No. <u>87</u>
<i>Sacramento</i> <small>This is to Certify, That the following described merchandise was weighed by a Public Weigh Master, and the seal hereto attached is a recognized authority of accuracy, as prescribed by Chapter 658, California Statutes 1915:</small>			
<small>Title</small> <u>7462 lbs Barley</u>	<small>Quantity</small> <u>754.240</u>	<small>Mark</small> <input checked="" type="checkbox"/>	<small>Carrier</small> <u>S.T. 1142</u> <u>896 - U.P.</u> <u>4911 - 6438</u>
<small>Merchandise delivered to</small> <u>River Warehouse.</u>	<small>Weighed for (or account of)</small> <u>Jas. D. Mason</u>	<small>By</small> <u>J. J. Jones</u> <small>(PUBLIC WEIGH MASTER)</small>	<small>Seal</small> <u>Frank S.</u>
DEPARTMENT OF WEIGHTS AND MEASURES			

Form of Public Weighmaster certificate of weight and measure.

"PUBLIC WEIGHMASTERS' CERTIFICATES OF WEIGHT."

Public Weighmasters' Certificates of Weight are generally accepted as instruments of accuracy by dealers and shippers of commodities. Their effective influence in stabilizing settlement by recorded net weight without irritating controversy, has been fully demonstrated in this department by the curtailment of complaints presented in the last two years.

The demands that certificates of weight accompany all sight drafts on purchases, wherein shipments of products are made by intrastate and interstate purchasers, is now the general rule, and not the exception.

The banking institutions of the state are basing their commercial exchange valuations upon the weight value as recorded in the certificates.

The Weights and Measures Act fixes the compensation of the Chief Deputy at \$1800 per annum, and I desire to most earnestly again recommend that the law be amended providing for a compensation commensurate with the duties imposed upon the Chief Deputy, which have been extended both in volume and responsibility.

The Weights and Measures Act fixes the compensation for the weights and measures officials throughout the state at \$5 per diem. This compensation is entirely inadequate and I most sincerely recommend that this compensation be increased to \$6 per diem, and for continued monthly employment, \$175 per month. Unless the compensation is commensurate with the duties and responsibilities of the service the

type of men required will not be attracted, and as a consequence efficiency and practicability will suffer. The compensation for the Sealers was fixed in 1913 and no increase has been made since that time notwithstanding the fact that living expenses, including all commodities, have greatly advanced.

"IN CONCLUSION."

In the executive work of your State Department of Weights and Measures, your Superintendent has conscientiously endeavored to employ all powers delegated to him under the Weights and Measures Act, for the general welfare of the people collectively and all official acts have been honestly intended in the interest of good public policy. Trade customs adopted to meet the practical demands of industry and whose operations have been consistent with honest trade principles have been encouraged. All customs in conflict with these principles have been sternly and fearlessly defeated.

Legitimate industry has responded liberally to the adoption of honest trade principles without drastic enforcement of restrictive law, and it has been in this spirit of co-operation that this department has enforced the weights and measures laws.

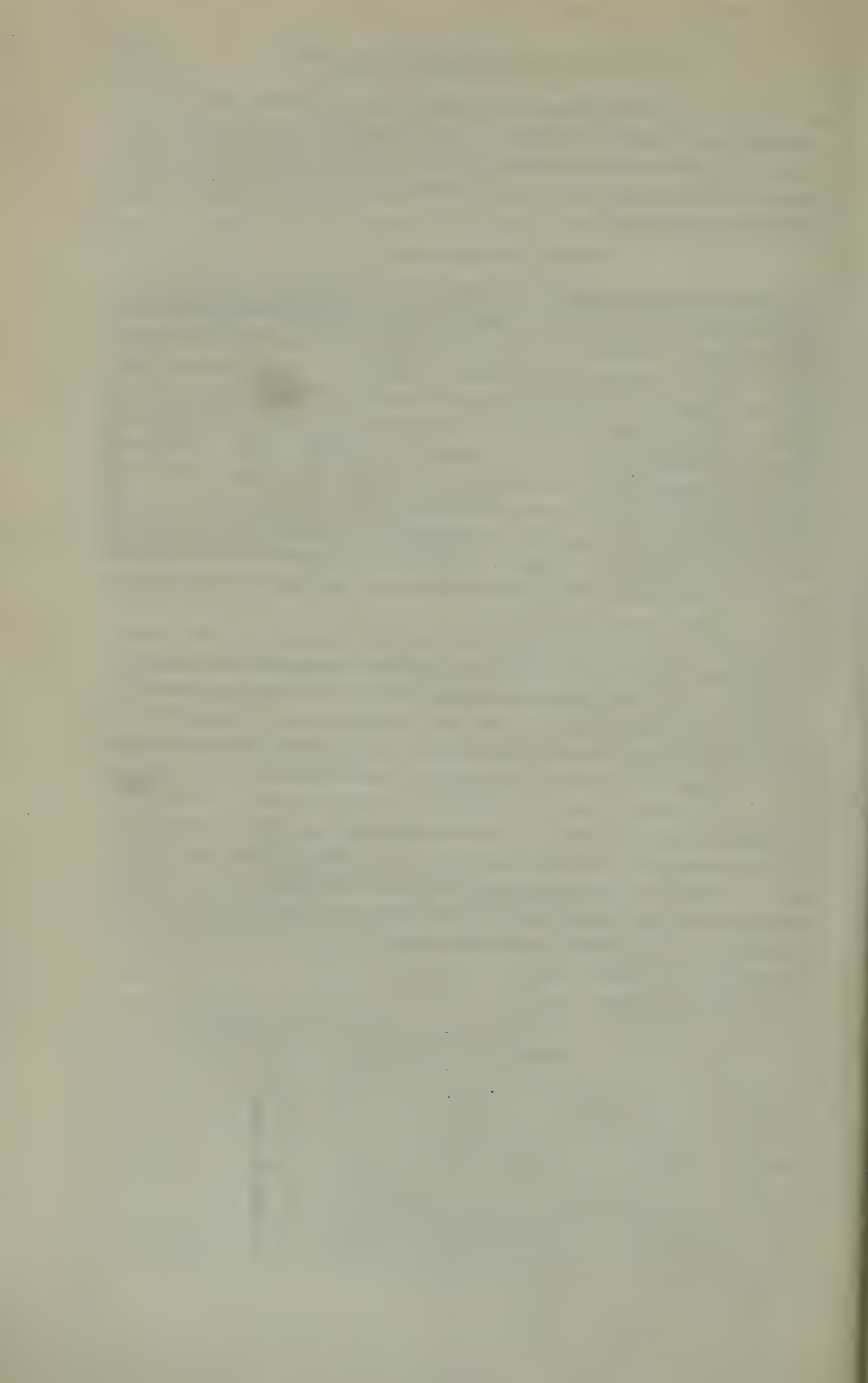
This service is now well grounded in the confidence of the people and the efficient manner in which the service is being extended and the general good resulting therefrom, fully justifies the expense thereof.

The general deportment of the men in this service throughout the State is good, and I may say exemplary. Their splendid cooperation with the State Department expresses a love for the service which is highly commendable and by which I have been enabled to accomplish the results herein recorded. If, in the course of time past, I have failed in the sum total of what may have been expected, it was alone due to the limitations of human energy, for I have consistently and fearlessly done by duty in accordance with the dictates of my conscience ever mindful of the trust and confidence reposed in me by the people whom I serve.

Respectfully submitted.

CHAS. G. JOHNSON,
State Superintendent Weights and Measures.

o



THIRD REPORT

OF

Purchasing Department

OF

STATE OF CALIFORNIA

November 16, 1920



CALIFORNIA STATE PRINTING OFFICE
J. M. CREMIN, Superintendent
SACRAMENTO, 1920

THE STATE OF NEW YORK

Purchase Department

STATE OF NEW YORK



REPORT OF STATE PURCHASING DEPARTMENT.

W. G. McMILLIN, PURCHASING AGENT.

November 16, 1920.

To the Honorable WM. D. STEPHENS,
Governor of the State of California,
State Capitol, Sacramento, California.

DEAR SIR: I submit herewith report of the work of the State Purchasing Department for the Seventieth and Seventy-first Fiscal Years.

I am dividing my report into subjects and will treat of the subject matter in the following order:

First—The total amount of purchases of staple commodities, showing the total purchases in those lines of goods by the leading or larger institutions and departments; the total of each line purchased for all departments, and the total of all lines purchased for all departments.

Second—Showing the various divisions of the Department according to function.

Third—Cost of the Department by function, and total cost of the Department and percentage of cost to total purchases.

Fourth—Report of the Testing Engineer.

Fifth—Report of the use of the Revolving Fund of \$200,000.

Sixth—A comparison of market conditions on many of the staple articles used in large quantities.

Seventh—Some examples of methods used in making savings and results accomplished.

Eighth—Possible future and recommendations of improvements in conduct of state business, from the standpoint of the economical purchase, distribution and care of merchandise.

MERCHANDISE PURCHASED.

In this tabulation we can not attempt to show the quantity of every article purchased by item as the list is too great, covering as it does some five thousand items, but we have grouped the articles into classes of merchandise according to their schedules and we show the total values of each class of commodities purchased for each of the large institutions and departments; the total value of all commodities purchased for these institutions and departments and the grand total purchased for all institutions and departments. And added to this we show the total emergency and confirmatory purchases made by the institutions and departments over which the Purchasing Department has had no supervision, except to look over the transaction after its completion.

TABLE

Commodity	Agnews State Hospital	Mendocino State Hospital	Napa State Hospital	Norwalk State Hospital
1. Groceries	\$70,412 91	\$47,127 99	\$72,880 53	\$20,874 55
2. Produce and dried fruit.....	52,058 52	29,043 95	52,128 33	7,834 31
3. Meat and provisions.....	162,080 57	93,150 91	173,904 68	43,731 79
4. Flour and cereals.....	61,682 47	46,072 51	70,303 08	16,350 56
5. Grains and feed.....	15,307 76	28,672 47	51,992 03	10,095 73
6. Fish, fresh	9,034 80	8,064 75	13,864 85	2,764 92
7. Tobacco	7,899 75	7,059 20	9,027 27	2,547 21
8. Soap and laundry supplies.....	10,628 83	6,628 53	28,687 33	4,511 97
9. Brooms, brushes and janitor supplies.....	3,417 19	2,064 18	2,943 78	1,217 39
10. Broom materials				70 00
11. Coal and wood.....	1,881 55	2,463 10	6,956 15	23 13
12. Clothing, hats, dry goods, etc.....	44,173 44	12,111 04	68,602 99	19,260 57
13. Leather and shoe findings.....	1,823 31	230 61	1,856 13	424 51
14. Crockery and glassware.....	3,148 78	1,931 98	4,581 65	3,097 33
15. Furniture and carpets.....	3,774 13	1,463 08	13,966 57	21,053 15
16. Stationery, office supplies and equipment.....	2,248 15	2,694 88	3,927 90	1,474 04
17. Drugs, chemicals and hospital supplies.....	4,595 36	2,925 08	12,322 39	3,764 27
18. Paints, oils, etc.....	2,773 99	901 70	4,890 38	3,075 54
19. Oils, burning and lubricating.....	95,603 68	47,865 96	78,891 51	12,205 59
20. Hardware	4,462 33	6,710 14	12,149 29	6,620 50
21. Plumbing supplies	2,756 17	368 98	1,128 35	1,805 58
22. Electrical supplies	2,760 24	1,042 86	3,120 03	1,382 64
23. Liquors and spirits.....	729 27	275 00	566 63	335 23
24. Photographic supplies	47 49		161 47	
25. Dental supplies	3 00			480 00
26. Sporting goods				
27. Printing supplies				
28. Lithographing, embossing and special printing				
29. Livestock	50 00	538 00	2,100 00	1,645 10
30. Automobiles	481 59		2,550 50	2,695 00
31. Auto accessories	44 29		38 49	14 00
32. Auto tires and tubes.....	428 16	229 59	1,699 09	555 05
33. Fire extinguishers			75 40	
34. Seeds	1,567 43	1,519 39	1,763 38	2,193 49
35. Musical instruments, etc.....				377 50
36. Shoes	435 26		417 58	890 00
37. Machinery and equipment.....	35 00	6,007 18	8,273 10	1,131 65
38. Mechanics' rubber and packing.....	972 11	407 51	651 10	250 59
39. Farm implements	1,478 72	3,833 05	3,131 31	1,672 38
40. Building material	955 46	409 55	3,462 54	1,490 65
41. Lumber	1,216 64	2,617 36	8,849 23	11,859 95
42. Cement	500 80	241 80	2,306 35	688 50
43. License plates, badges, etc.....				
44. Miscellaneous	17,599 89	1,132 59	4,156 97	9,547 76
45. Blanket and confirmatory orders.....	18,092 90	6,555 45	21,437 35	20,808 82
Totals	\$607,137 62	\$372,351 42	\$779,746 41	\$240,832 55

REPORT OF STATE PURCHASING DEPARTMENT.

5

1.

Stockton State Hospital	Southern Cal. State Hospital	Industrial Home for Adult Blind	Sonoma State Home	Veterans' Home of California	Cal. State Prison, San Quentin	Folsom State Prison	Cal. School for Deaf and Blind
\$100,065 64	\$82,081 92	\$6,690 54	\$50,781 58	\$31,509 66	\$94,563 16	\$33,630 42	\$9,477 49
20,298 12	47,350 89	6,193 37	29,199 93	20,833 84	90,784 61	46,811 69	6,548 05
174,235 03	153,429 91	15,971 72	89,296 42	60,236 82	216,082 35	75,347 81	17,904 85
70,508 49	67,786 56	3,806 27	42,734 42	17,853 50	82,233 14	50,276 07	5,920 23
32,788 09	62,411 67	-----	45,993 67	33,082 81	23,086 88	13,504 17	16,275 97
13,434 90	5,632 00	924 12	4,255 05	2,635 00	12,300 75	3,999 00	854 50
14,592 14	9,159 80	-----	708 04	1,832 98	21,929 51	8,787 56	-----
26,058 06	12,653 58	553 64	15,612 82	6,738 34	14,562 83	3,905 46	3,165 57
3,646 55	1,668 32	5 58	2,108 46	1,691 89	3,125 00	2,002 94	958 57
303 50	791 47	79,421 23	-----	-----	-----	-----	83 62
11,027 95	4,518 20	184 16	11,497 35	3,004 70	26,839 50	8,805 70	1,079 50
85,698 70	24,877 56	1,284 56	53,944 38	36,972 15	153,228 39	41,470 14	5,530 04
6,280 84	4,216 59	59 00	2,683 56	773 80	75,874 81	16,014 04	2,014 12
6,508 31	8,806 00	721 85	5,634 48	3,535 44	1,917 46	642 40	998 40
6,998 43	3,968 58	204 88	9,040 40	2,405 33	6,519 96	1,355 70	1,484 38
3,037 28	4,147 46	637 22	2,635 46	1,543 25	10,352 51	3,055 54	4,317 20
10,771 22	4,317 15	643 93	10,480 38	11,644 69	5,436 37	4,578 44	757 43
4,262 45	5,296 21	129 95	5,968 88	1,035 20	16,204 61	1,633 27	1,072 93
60,424 95	65,427 72	6,714 58	45,657 57	54,937 17	52,249 52	29,077 01	19,068 55
10,614 03	6,705 67	1,093 07	7,643 34	3,458 89	33,635 98	7,228 09	620 88
784 22	1,642 48	14 00	3,098 08	518 20	6,392 06	512 21	529 89
2,619 14	1,878 13	90 37	4,030 63	689 97	7,192 70	2,309 84	338 02
1,137 95	110 50	4 34	441 22	1,205 91	44 00	-----	-----
4 50	15 27	26 80	18 80	-----	6,014 68	1,326 63	-----
228 16	169 00	-----	-----	-----	1,650 94	1,858 12	41 16
-----	60 00	36 16	-----	-----	-----	551 42	-----
-----	-----	-----	51 25	-----	5,487 03	981 85	-----
-----	-----	-----	-----	-----	-----	-----	-----
5,535 00	346 50	-----	2,169 47	1,174 00	1,387 00	2,440 00	-----
-----	2,026 00	-----	2,684 00	1,456 90	2,430 00	4,938 18	-----
-----	837 52	11 05	315 17	62 83	226 88	437 12	34 62
445 58	877 98	172 93	566 37	736 15	1,414 08	384 46	163 70
527 88	-----	-----	77 40	68 50	95 10	4 38	-----
4,590 17	1,633 15	-----	1,182 80	922 53	365 49	958 63	180 38
-----	54 10	-----	243 03	-----	263 36	324 71	1,068 50
682 64	91 54	-----	2,189 00	2,828 38	83 73	65 37	298 33
1,279 65	2,152 54	-----	2,129 50	2,117 21	12,018 75	1,681 00	-----
1,312 45	879 97	149 75	1,446 39	674 54	1,606 48	743 80	96 75
1,267 10	6,967 28	10 20	451 05	1,513 73	259 20	1,567 79	11 70
3,730 60	2,057 88	5 50	1,863 99	25 60	1,306 46	863 28	27 45
8,422 41	6,478 81	-----	5,161 37	1,771 57	24,305 62	9,627 14	481 22
1,544 24	1,990 51	-----	212 00	-----	2,465 90	575 75	56 25
-----	6 65	-----	-----	-----	-----	-----	-----
6,294 06	4,962 74	5,927 34	3,647 23	4,775 88	14,931 28	3,649 92	973 11
21,148 95	12,431 36	8,587 15	5,692 90	8,892 50	501,500 92	7,356 92	7,072 38
\$723,045 38	\$652,836 17	\$140,275 56	\$473,567 89	\$325,162 44	\$1,532,415 00	\$396,262 99	\$109,503 74

TABLE I

Commodity	California School for Girls	Preston School of Industry
1. Groceries	\$6,637 23	\$23,925 53
2. Produce and dried fruit	4,347 30	19,331 36
3. Meat and provisions	11,244 34	31,012 76
4. Flour and cereals	6,030 58	19,585 92
5. Grains and feed	6,012 41	24,607 88
6. Fish, fresh	731 74	1,460 23
7. Tobacco		
8. Soap and laundry supplies	1,925 77	3,769 62
9. Brooms, brushes and janitor supplies	398 23	1,657 50
10. Broom materials		
11. Coal and wood	16,705 10	750 25
12. Clothing, hats, dry goods, etc.	7,438 02	28,885 58
13. Leather and shoe findings	261 25	6,725 85
14. Crockery and glassware	2,908 45	2,206 03
15. Furniture and carpets	9,545 74	2,739 23
16. Stationery, office supplies and equipment	1,538 14	1,518 95
17. Drugs, chemicals and hospital supplies	1,301 43	1,332 85
18. Paints, oils, etc.	481 76	657 85
19. Oils, burning and lubricating	2,971 98	39,167 58
20. Hardware	3,177 49	5,516 20
21. Plumbing supplies	566 21	945 03
22. Electrical supplies	2,420 62	1,319 35
23. Liquors and spirits		34 75
24. Photographic supplies	570 65	282 60
25. Dental supplies	1,103 50	93 56
26. Sporting goods	331 50	1,340 24
27. Printing supplies		469 57
28. Lithographing, embossing and special printing		
29. Livestock	925 00	1,094 00
30. Automobiles	581 49	2,814 44
31. Auto accessories	106 79	525 73
32. Auto tires and tubes	714 43	1,375 97
33. Fire extinguishers	615 00	25 45
34. Seeds	578 41	1,711 91
35. Musical instruments, etc.	1,102 93	1,641 47
36. Shoes	2,099 60	178 23
37. Machinery and equipment	57 50	1,877 52
38. Mechanics' rubber and packing	922 92	393 30
39. Farm implements	320 86	963 99
40. Building material	18 30	55 80
41. Lumber	371 30	3,454 49
42. Cement		14 36
43. License plates, badges, etc.		
44. Miscellaneous	749 65	1,319 00
45. Blanket and confirmatory orders	1,730 91	20,257 11
Totals	\$99,844 86	\$260,087 61
Total purchases, Harbor Commission Branch (see Table II)		
Grand total		

—Continued.

Whittier State School	State Printing Dept.	Motor Vehicle Dept.	State Engineering Dept.	Napa State Farm	Pacific Colony	Sundry de- partments including Normal Schools	Totals
\$15,824 75			\$5,254 49	\$402 15		\$10,875 39	\$685,996 63
14,476 25						846 30	448,136 82
28,229 05			1,575 20			3,157 99	1,390,551 30
15,324 40						695 89	577,112 99
30,406 34				3,698 03		38,196 96	466,118 87
2,476 54							82,453 15
							83,513 46
5,177 79	\$249 00		276 75		\$124 73	2,140 26	147,371 01
1,200 93		\$3 50	76 78			4,595 66	82,872 50
							80,669 82
438 00						4,535 41	100,717 75
20,063 55		18 00	156 51			21,689 06	626,475 26
6,128 25						670 61	126,037 23
2,296 10	17 49		156 00			1,706 98	50,874 18
2,491 90	95 00	671 60	10,772 85		32 75	45,644 11	144,507 77
2,542 61	2,535 36	33,578 53	9,827 07		88 39	229,524 02	321,274 53
3,290 34	45 55	5 12				72,302 75	150,514 75
4,412 49	409 59	39 21	16,469 98			6,844 25	76,579 24
7,619 15	809 49		402 25	3 50		30,650 57	649,306 28
9,687 68	1,873 62	149 40	124,568 65			48,878 82	294,799 07
1,484 72			54,833 59			5,777 17	88,196 94
3,880 81	1,065 76	274 40	57,875 40			14,527 77	106,758 68
29 50						197 99	5,082 29
55 22						1,978 59	10,502 19
165 80						147 05	5,940 25
960 91						3,851 33	7,161 52
2,845 56	557,855 04					40,252 03	607,892 38
		486 25				22,610 28	23,096 53
1,047 62				219,513 03			239,962 72
2,300 00	893 96	13,911 46	1,643 04	1,478 32		70,355 24	113,300 11
129 83	45 15	333 85	562 18	178 14	35 45	3,990 38	7,929 47
333 16	353 35	652 59	1,979 40	538 28	37 14	11,690 24	25,313 23
		13 15	106 96	295 00	7 50	1,136 00	3,047 72
2,048 31				3,090 43	177 60	14,947 31	39,430 83
121 17						2,930 81	8,127 58
180 40			117 32			204 26	10,761 67
7,860 15			20,010 24	134 00	51 00	43,202 50	110,018 49
694 88		7 50	435 06	67 50	25 29	1,904 83	13,732 72
1,757 42	17 34			1,929 76		15,037 06	42,129 94
842 62	4 50		115,516 76			10,391 81	143,034 69
5,596 26	4,630 28	1,159 19	162,952 07	1,204 82		80,100 12	340,319 85
			59,495 64	80 75		16,921 26	87,094 11
		376,519 23				3,115 98	379,641 86
6,105 15	5,730 59	32 96	23,310 89	75 30	63 00	34,320 70	152,305 05
13,729 41	19,555 45	29,832 83	79,470 09	31,790 76	445 18	375,365 32	1,211,770 66
\$224,315 02	\$505,681 51	\$457,688 76	\$750,935 77	\$264,515 75	\$1,088 08	\$1,227,940 76	\$10,304,279 58
							1,031,043 28
							\$11,335,322 86

TABLE II.

PURCHASES FOR THE STATE HARBOR COMMISSION (By the Harbor Commission Branch).	
Automobile repairs and accessories.....	\$3,168 88
Automobile tires and tubes.....	2,112 56
Cement.....	84,166 93
Distillate, gasoline and kerosene.....	6,222 42
Lubricating oils.....	3,037 24
Fuel oil.....	148,484 56
Paints, oils and glass.....	14,826 00
Piling.....	210,880 88
Lumber.....	144,925 25
Railroad equipment.....	9,542 86
Lamps and globes.....	7,467 49
Rock, sand and gravel.....	17,064 39
Steel cable.....	50,043 31
Rope, manila and cotton.....	12,669 79
Machinery and equipment.....	80,929 79
Automobiles and trucks.....	3,748 40
Electrical supplies.....	54,170 04
Plumbing supplies.....	18,860 29
Iron and steel, heavy.....	44,741 57
General hardware.....	81,606 91
Miscellaneous.....	32,153 72
	<hr/> \$1,031,043 28

DIVISION OF DEPARTMENT AS TO FUNCTION.

The executive staff of the Department is as follows:

W. G. McMillin.....	State Purchasing Agent
Arthur Baker.....	Deputy Purchasing Agent
Arthur J. Burton.....	Assistant, Harbor Commission Branch
J. F. Misphey.....	Assistant Purchasing Agent, stationery, school and office supplies, etc.
E. H. Kahrs.....	Assistant Purchasing Agent, dry goods, leather goods, drugs, etc.
Chas. O. Palm.....	Buyer, plumbing and electrical supplies, hardware, etc.
J. J. Garvey.....	Buyer, building materials, machinery, etc.
Chas. L. Peters.....	Chief Clerk
Geo. L. Baxter.....	Testing Engineer

The main office is situated in rooms 87-88-89-90, third floor, Capitol Building, where all estimates and requisitions for the purchase of all supplies for all the state institutions and departments are received and acted upon. All firms wishing to compete for state business are sent requests for prices from this office. All bids are received, analyzed and tabulated here; all samples, where required, are received and passed upon; awards are made and all orders for the delivery of goods are sent out from here, amounting to a total of \$11,335,322.86 for the past two years; all correspondence relating to the purchase, delivery or complaints on merchandise is handled here. We receive an average of three hundred pieces of mail daily, and send out an average of two hundred and fifty pieces daily.

Here are employed in addition to the executive staff, one secretary-stenographer, one checker and verifier of orders, one tabulation clerk, nine stenographers and typists, one office boy and mailing clerk, and one filing clerk.

In the store division in the Capitol Building are employed one store-keeper, one stenographer and typist, one shipping clerk and packer, one packer and janitor.

In the testing division in the Forum Building are employed one state testing engineer, one assistant engineer and chemist, one stenographer and typist.

In the Harbor Commission Branch of the State Purchasing Department and store are employed one assistant purchasing agent, one assistant buyer, two stenographers and typists, one storekeeper, one record clerk.

In Los Angeles we carry a small stock of stationery and office supplies in charge of the custodian of the state offices at that place.

Making in all a total of thirty-four employees to handle this immense amount of business.

COST OF OPERATING DEPARTMENT.

The cost of operating the Department according to function for the two fiscal years closing June 30, 1920 was as follows:

MAIN OFFICE—

Salaries	\$70,660 95	
Fixtures	3,524 42	
Supplies	6,990 65	
Postage	5,087 00	
Traveling expenses.....	2,454 45	
Telephone and telegraph.....	3,504 45	
Auto expense.....	876 78	
Tearing out walls and remodeling office	876 13	
Miscellaneous	733 59	
		<hr/> \$94,708 42

CAPITOL BUILDING STORES—

Salaries	7,660 00
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TESTING DEPARTMENT—

Salaries	\$10,062 12	
Supplies, including chemicals, etc.....	2,363 34	
		<hr/> 12,425 46

HARBOR COMMISSION BRANCH (Main Office)—

Salaries	10,657 50
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HARBOR COMMISSION STORE—

Salaries	7,123 54
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Total cost.....	\$132,574 92
Total amount of purchases.....	\$11,335,322 86
Total amount of business done by Stores Division.....	\$693,574 67
Percentage of cost of operating.....	1.1695 per cent

REPORT OF TESTING ENGINEER.

During the period beginning July 1, 1918 and ending June 30, 1920, this testing laboratory has been instrumental in saving the state quite a sum in the matter of rebates as in the case of double belting for San Quentin when an allowance was granted on account of weight shortage, but where the material could be used to good advantage. Unsatisfactory varnish has been rejected and the company furnishing have made replacement with specified material. After considerable discussion a coal company has agreed to allow a rebate account low heat value of their coal.

Tests of lubricating oil for the Harbor Commission showed that the cheaper oil was the better—a condition which is usually reversed.

Tests on tableware for use at state institutions showed a wide difference in the amount of plating on the different brands and enabled us to make a money saving choice from the samples submitted. The same saving was made on the selection of garden hose, roofing, soaps, fabrics, liquid soap, etc.

The claim of an ink manufacturer that his ink could not be removed from paper was refuted when submitted for test.

Our previous specifications for liquid soap which did not permit competitive bidding has been revised so that open competition is possible.

In some instances the inspectors of the Engineering Department on a job are lax in checking the material delivered and necessary samples from the delivery are not submitted to the laboratory for tests. We may buy and pay the price for the very best material, but unless deliveries are properly checked we have no assurance that we are getting what we buy.

The different state institutions, with the exception of Preston School of Industry, Folsom State Prison and Industrial Home for the Adult Blind at Oakland, have been in active cooperation with the testing laboratory as shown by the number of samples submitted for test.

The laboratory has been forced to reject 6.6 per cent of the materials submitted for test from the different state institutions and has also been able to eliminate a lot of trouble and complaint by condemning a lot of material submitted for examination before purchase was made.

The testing laboratory exercises a moral effect on bidders in general as they appreciate the fact that substitution will be detected in the laboratory and cause rejection and replacement of material at their expense.

The following is the detailed report for the two years ending June 30, 1920, giving the number of samples received, tested, total cost, net

operation and total cost per test of all samples received from state departments.

Total Samples Received and Tested, Showing Total Cost and Cost per Test.

Month	Samples received	Samples tested	Total cost	Charges made for tests made for other departments	Net operation	Total cost per test
1918—						
July	82	84	\$598 44	\$23 02	\$575 42	\$7 131
August	96	103	602 53	20 97	581 56	5 849
September	50	55	676 64	13 57	663 07	12 302
October	104	109	429 60	8 86	420 74	3 941
November	103	98	447 40	6 59	440 81	4 565
December	96	89	504 55	17 19	487 36	5 689
1919—						
January	65	62	579 89	2 15	577 74	9 336
February	47	58	551 14	---	551 14	9 502
March	157	130	493 92	11 53	482 39	3 799
April	53	73	474 81	2 87	471 94	6 504
May	79	62	513 02	7 90	505 12	8 274
June	89	101	463 34	14 98	448 36	4 587
July	64	64	787 18	1 59	785 59	12 299
August	41	41	564 35	---	564 35	13 764
September	79	79	474 90	6 61	468 29	6 011
October	48	47	512 80	1 19	511 61	10 910
November	29	28	184 38	3 13	181 20	6 583
December	36	85	219 75	---	219 78	2 585
1920—						
January	72	71	362 27	---	362 27	5 102
February	57	56	540 20	---	540 20	9 646
March	160	127	497 45	---	497 43	3 909
April	99	99	501 82	---	501 82	5 083
May	77	77	539 18	---	539 18	7 002
June	114	114	505 20	---	505 20	4 431
Totals	1947	1912	\$12,024 82	\$142 20	\$11,872 62	\$168 769

Total tests made.....	1912
Total net cost.....	\$11,872 62
Average cost per test.....	6 21

The monthly average shows over 81 samples tested at a total cost of \$6.21 each, or something over 3 complete tests for each working day.

The following shows materials tested during the two years:

Aggregate.	I.ye.
Alcohol.	Oils (mineral and vegetable, lubricating and paint, also burning oils).
Belting.	Paint colors.
Benzine.	Paints, ready mixed.
Bituminous materials.	Paint thinner.
Blackboard.	Pipe.
Blankets.	Pipe covering.
Blotting paper.	Plaster materials.
Bluing.	Polish.
Boiler compound.	Pumice stone.
Boiler feed water.	Putty.
Bronze powder.	Roofing (asphalt and cement).
Bronzing liquid.	Roofing (paper and felt).
Carbolic acid.	Screenings.
Cement.	Shellac.
Chloride of lime.	Shellac substitute.
Coal.	Silverware.
Dryers.	Soap.
Dye.	Soap chips.
Enamel.	Soap powder.
Engine distillate.	Soda.
Fabric.	Stains.
Felt.	Starch.
Fire brick.	Tickings.
Floor dressings.	Tile.
Gasoline.	Turpentine.
Glue.	Turpentine substitute.
Greases.	Type metal.
Hinges.	Varnish.
Hose.	Wall finish.
Ink.	Water.
Insulation.	Water-proofing and damp-proofing materials.
Iron sheets.	Wax.
Kalsomine.	Wood fillers.
Kerosene.	Zinc oxide.
Lead (red and white).	
Leather (sole and hide).	
Lime.	

The percentages of materials accepted, testing good, fair, poor, those rejected, those tested for information and those on which no test was necessary, are as follows:

Accepted -----	34.2 per cent	Rejected -----	6.6 per cent
Good -----	3.9 per cent	Information -----	39.7 per cent
Fair -----	4.6 per cent	No test necessary -----	6.0 per cent
Poor -----	5.0 per cent		

Following is a list showing the number of samples submitted for test by the state institutions during the period of July 1, 1918, to June 30, 1920:

Engineering Department.....	261	Los Angeles Normal School.....	7
Veterans' Home.....	165	Preston School of Industry.....	7
Weights and Measures.....	105	California School for Girls, Ventura	4
Stockton State Hospital.....	104	Capitol Commission.....	3
Norwalk State Hospital.....	63	Industrial Home of Mechanical	
San Quentin State Prison.....	52	Trades for Adult Blind.....	3
Sonoma State Home.....	39	Fish and Game Commission.....	2
Napa State Hospital.....	37	San Jose Normal School.....	2
Harbor Commission.....	37	Southern California University of	
Agnews State Hospital.....	32	California.....	2
California School for Deaf and		Board of Control.....	1
Blind.....	31	Highway Commission.....	1
Mendocino State Hospital.....	28	Reclamation Board.....	1
Southern California State Hospital	25	Land Settlement Board.....	1
Whittier State School.....	20	California Polytechnic School.....	0
Folsom Prison.....	12	Fresno Normal School.....	0
Printing Department.....	9	San Francisco Normal School.....	0
Chico Normal School.....	8	Santa Barbara Normal School.....	0

GEO. L. BAXTER,
Testing Engineer.

REPORT OF THE USE OF REVOLVING FUND OF TWO HUNDRED THOUSAND DOLLARS ESTABLISHED BY CHAPTER 462, STATUTES OF 1918.

A word of explanation of the following report will assist in a better understanding. The turnover has not been so great as it should have been, nor as I had expected it would be, for two reasons: First, because of market conditions making it necessary to be unusually cautious in the purchase of merchandise in anticipation of future needs, it being almost an utter impossibility to forecast with any degree of certainty the condition of the market; and second, because my plan of enlarged store activities did not meet with the hearty approval and cooperation of the Board of Control, whose approval I must have according to the State Purchasing Department Act before I can institute any program of enlarged activity, caused no doubt by the uncertain markets noted above. Ordinarily the turnover of a \$200,000 capital should be at least three times in a year or \$600,000, whereas, the total business for the year in this fund has been but \$427,937.63.

Notwithstanding this apparently small turnover compared to the total amount of the fund due to the conditions before mentioned, namely, a market too uncertain to warrant speculation, and delay in approval of the control body, let me point out to you that at no time during the period was our cash balance in the revolving fund lower than \$100,000, showing that the actual money used in the transaction of the business was turned over more than three times, and every purchase made with this fund shows a saving of from 2 per cent cash discount to a maximum of $33\frac{1}{3}$ per cent.

Therefore, notwithstanding the fact that the business done on the capital available has not been up to the maximum possible considering the size of the capital, a very large saving has been made for the State in the purchase of large quantities of merchandise on which we have been able to take advantage of the opportunity by having the cash to swing the deal at the proper time. A considerable amount has also been saved to the State by the discounts for cash made available by reason of the revolving fund.

SALES, STORES DIVISION.

July 1, 1918 to June 30, 1920.

1918		
July	-----	\$33,646 27
August	-----	20,557 81
September	-----	22,376 51
October	-----	36,342 18
November	-----	34,295 58
December	-----	29,889 64
1919		
January	-----	13,538 90
February	-----	13,940 51
March	-----	17,582 79
April	-----	14,474 75
May	-----	9,876 79
June	-----	6,736 74
1919		
July	-----	38,426 13
August	-----	19,987 41
September	-----	8,211 30
October	-----	31,673 71
November	-----	39,391 43
December	-----	30,594 22
1920		
January	-----	44,741 19
February	-----	19,754 24
March	-----	39,083 60
April	-----	41,934 69
May	-----	19,851 43
June	-----	49,156 74
		<hr/> \$636,004 56

TOTAL PURCHASES THROUGH REVOLVING FUND.

July 1, 1918, to June 30, 1919.....	\$265,637 04
July 1, 1919, to June 30, 1920.....	427,937 63
	<hr/> \$693,574 67

NOTE—The \$200,000 revolving fund became available July 1, 1919. Prior to that time we were working on an emergency fund given us by the Board of Control, of \$50,000.

**STATEMENT OF STATUS OF THE REVOLVING FUND AND RELATED
ACCOUNTS AS OF JUNE 30, 1920.**

Assets.

Balance in revolving fund, chapter 462-1919, in the State		
Treasury		\$70,675 75
Cash revolving fund (checking account)		5,000 00
Cash on hand (unremitted collections)		30,628 63
Accounts receivable		53,952 26
Inventory:		
Sacramento—		
Stationery	\$27,063 31	
Dry goods and sporting goods	1,547 79	
San Francisco—		
Stationery	5,481 74	
Dry goods	43,002 20	
Hardware	1,740 92	
Beans	2,788 14	
Los Angeles—		
Stationery	1,247 95	82,872 05
Total assets		\$243,128 69

Accountability.

Accounts payable	\$990 71	
Appropriated funds	208,710 50	
Revolving fund—Chap. 462, Stats. 1919	\$200,000 00	
Support appropriation, Chap. 421, Stats. 1917 (portion expended for purchase of supplies)	8,710 50	
Inventory May 1, 1916, at creation of the Purchasing Department		
Department	4,014 65	
Increase in operating assets	29,412 83	
Total accountability		\$243,128 69

The following is report of the audit by the Chief Accountant.

To the Honorable, the STATE BOARD OF CONTROL,
Sacramento, California.

GENTLEMEN: We have made an examination of the accounts of the State Purchasing Department presenting transactions affecting the State Purchasing Department Revolving Fund created by chapter 462, Statutes of 1919, and present herewith authenticated statement of the status of the revolving fund and related accounts as of June 30, 1920.

Verification has been made of the accuracy of inventories. Physical condition of stocks in the Sacramento and San Francisco storerooms was found satisfactory. Particularly efficient storekeeping methods are reflected by the condition of the store-room at San Francisco, where the principal stock is kept.

Attention is respectfully directed to an item in the statement of the accountability of the Department, representing an amount of \$8,710.50 expended from the appropriation for support, sixty-ninth and seventieth fiscal years, for the purchase of stock. It is suggested, inasmuch as the amount so expended was subsequently returned to the State Treasury through the sale of the stock, and when returned was deposited to the credit of the revolving fund, that a reimbursement to the general fund for this amount is properly due, from the present balance in the revolving fund.

Respectfully submitted.

CORNING DE SAULES,
Superintendent of Accounts.

Sacramento, California, August 24, 1920.

COMPARISON OF MARKET PRICE AND PRICES PAID BY THE STATE ON A FEW STAPLES.

	July, August and September, 1918		October, November and December, 1918		January, February and March, 1919		April, May and June, 1919		July, August and September, 1919		October, November and December, 1919		January, February and March, 1920		April, May and June, 1920	
	Average market price delivered at institutions	Average purchase price delivered at institutions	Average market price delivered at institutions	Average purchase price delivered at institutions	Average market price delivered at institutions	Average purchase price delivered at institutions	Average market price delivered at institutions	Average purchase price delivered at institutions	Average market price delivered at institutions	Average purchase price delivered at institutions	Average market price delivered at institutions	Average purchase price delivered at institutions	Average market price delivered at institutions	Average purchase price delivered at institutions	Average market price delivered at institutions	Average purchase price delivered at institutions
* Beef, fresh, steer	lb.	20	22.73	21	22	22	23	20	1885	165	1585	17	205	185	19	17
Hams	lb.	36	305	39	365	39	375	41	3425	44	375	1496	36	185	41	339
Bacon	lb.	44	37	475	40	46	405	455	395	45	4125	392	36	2935	46	349
Lard compound	lb.	2225	2297	24	2275	245	2225	285	1968	28	24	345	41	3275	22	349
Butter	lb.	664	6958	185	684	6775	6765	6765	674	12	19	115	295	2143	23	22
Sched. oil	gal	264	135	264	188	264	188	229	1.71	2.56	2.10	2.33	2.00	2.33	2.25	2.148
Sugar, D. C.	lb.	98	105	99	105	99	105	99	0885	09	0885	09	091	1071	09	1071
Coffee	lb.	69	48	685	685	685	685	685	685	685	685	685	685	685	685	685
Potatoes	lb.	135	125	185	125	125	125	125	125	125	125	125	125	125	125	125
Beans, pink	lb.	6225	6193	6225	6225	624	6225	624	6225	624	6225	624	6225	624	6225	624
Peas	lb.	6665	6775	672	675	665	6702	6675	672	672	672	672	672	672	672	672
Apples, unimported	lb.	13	69	11	6925	15	10	20	135	215	135	19	16	168	175	11196
Red cut and cut meat	lb.	18	1426	18	1491	1825	131	19	1599	25	1919	23	2017	22	1798	16
Flour	bbi	682	6615	683	6722	683	6567	683	6523	679	6523	675	6615	675	1674	68
Barley, whole (earhead lots)	lb.	6275	6244	6225	6215	625	624	631	6215	6325	6275	6365	6325	635	6365	6325
Barley, rolled (earhead lots)	lb.	629	629	6275	6249	625	62425	6255	6211	6325	62665	6365	6365	638	635	6344
Molasses	lb.	618	617	618	6168	6185	61564	6205	621175	6215	62115	6225	6202	625	6255	627
Wool, Sheeting:																
64 bleached	yd.	58	38	371	.....	34	365	33	.....	41	435	50	.....	50	.....	50
64 bleached	yd.	51	505	42	.....	42	.....	42	.....	57	555	63	.....	63	.....	63
64 unbleached	yd.	54	55	55	57	50	.....	50	.....	64	623	74	.....	74	.....	74
64 unbleached	yd.	535	385	5	57	35	31	365	30	465	865	47	.....	47	.....	47
64 unbleached	yd.	45	44	40	.....	39	375	365	365	54	505	56	34	575	54	56
64 unbleached	yd.	485	485	54	.....	42	43	58	55	65	65	66	.....	66	.....	66
64 unbleached	yd.	265	275	265	.....	19	.....	215	225	28	291	31	.....	38	37	385
64 unbleached	yd.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
64 unbleached	yd.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Woollen clothing	yd.	32	375	285	27	23	215	21	2289	28	2725	33	325	34	325	34
Woollen clothing	yd.	32	325	30	28	21	20	21	20	20	20	20	20	20	20	20
Woollen clothing	yd.	43	435	42	.....	35	.....	35	.....	425	45	45	.....	45	.....	45
Woollen clothing	yd.	38	38	38	.....	27	2725	245	2825	325	315	.....	325	375	35	35
Wool oil (n. a. b. refinery)	bbi	.....	1.60	.....	1.60	.....	1.60	.....	1.60	.....	1.60	.....	1.60	.....	1.60	1.85

* Note: It must also be noted that the quality of the fresh beef under our specification is better than the average run of fresh beef quoted by the wholesaler. In addition there is deducted from each cwt. a total of 12 lbs. to compensate for shrinkage, the practice not being followed by the wholesaler when selling to the trade. In comparing the above prices bear in mind that the market price is listed for f. o. b. shipping point, the price paid by the department is delivered at destination.

NOTE: All prices on dry goods tabulated herewith are eastern prices, to which add 5 per cent to cover freight charges to the coast.

COMPARISON OF PRICES AND MARKET CONDITIONS.

When the appropriations of the last Legislature for the various activities of the state were in the making the consensus of opinion among men who were best able, by reason of their experience, to judge as to the probable future, was that prices of by far the larger number of staple commodities had reached their highest point and that while there would probably be no appreciable decline for at least a year, there would be no further serious advances. Instead of these predictions coming true this is what actually happened. The general average of prices on all commodities kept climbing, reaching its highest level in June 1920 at which time it took \$2.70 to purchase what \$1.00 would buy in 1916. In the following table of prices on the staple articles of food of which the state uses large quantities, in one column is shown the prices paid by the state for each quarter during the two fiscal years. In the parallel column is shown the average regular jobbing prices prevailing during the same periods. This arrangement I trust will give you first, an idea of the range of prices for the period and second, a comparison of the prices secured by the state and the regular jobbing or wholesale prices ruling.

EXAMPLES OF TRANSACTIONS WHERE SAVINGS HAVE BEEN MADE IN EXERCISE OF JUDGMENT BASED ON A KNOWLEDGE OF MARKETS AND MERCHANDISE.

We have selected only a few instances from each line of commodities for purposes of illustration, but these examples we trust will indicate some of the methods we employ and the opportunities of which advantage is taken. Such instances as those we have taken as examples have been multiplied many times during the two last fiscal years.

1. By anticipating the coal requirements for the year 1920-21, we were able in June this year to place contracts on the following basis, delivered at the following points:

Quantity	Delivery point	Price	Amount
340 tons range coal.....	Agnews	\$9 69	\$3,294 60
360 tons range coal.....	Eldridge	10 69	3,848 40
225 tons range coal.....	Napa	10 35	2,328 75
100 tons range coal.....	Patton	10 85	1,085 00
4 tons range coal.....	Oakland	13 27	53 08
450 tons range coal.....	San Quentin	13 55	6,097 50
500 tons range coal.....	Ventura	11 35	5,675 00
			<hr/>
1979			\$22,382 33

Within ten days after award of contract, prices advanced at the mines approximately 70 cents per ton; in addition to this, we were advised of a probable increase in freight rate, which increase we forestalled by placing orders and securing deliveries before the advance on September 25th, at which time the rate advanced 25 per cent on all main line points. Thus by our knowledge of the situation we saved the state 70 cents per ton in price and an average of more than \$2 per ton in freight, or a total of approximately \$5,400.

2. Through the efforts of the Purchasing Department in insisting that purchases of all motor cars, and particularly where second hand cars were to be traded in, be made only after competitive bids have been invited, the state has been able to receive from one or two manufacturers a discount of 10 per cent off factory list price of machines, and the prevailing allowance on second hand cars has been increased approximately 10 per cent over previous methods of purchasing—all resulting from giving dealers throughout the state an opportunity to quote on state requirements.

3. In February, this year, we were requested to purchase certain cast iron rings for concrete pipe molds, to be used in the cement pipe factory operated by the State Land Settlement Board, Delhi Colony. The purchase estimate was approved at an estimated cost of \$3,875, and competition was invited from firms who regularly make this class of material, with unsatisfactory results, although at a price within the approved estimate. Special effort was then made by us to interest firms

who were properly equipped to manufacture this class of material, with the result that purchase was consummated at a total price of \$3,200—a saving of \$675.

4. Last January, we anticipated institutional requirements on garden hose and placed an order at a very low figure for 5000 feet to be manufactured in accordance with our specifications. Subsequently orders were placed for 10,000 feet additional at a very low price for factory delivery, the distribution being made to the institutions from the Stores Division, San Francisco. From these quantity purchases we have saved state institutions from 4 to 9 cents a foot, or at least \$800 on this single commodity.

5. In the purchase of paints, we make use of specifications to insure receipt of material of high and uniform quality. The specification eliminates the reference to brand names and thus affords all bidders an equal opportunity to figure on the state's requirements. Because of this, we are able to buy the best quality materials at prices from 20 to 25 per cent under prices of proprietary articles.

6. On purchases of automobile accessories, we are able to obtain prices at 25 per cent under the retail list and even on confirmatory purchases made by institutions and departments we have been able to have firms correct their invoices to the hundred lot price. We watch also bills to cover confirmatory purchases of Ford parts, and where the repair work is done by the institution, we insist on a 25 per cent discount which is permitted by the Ford Company to state institutions.

7. A department specified a face brick of certain manufacture and claimed that only one manufacturer could supply the quality desired. We requested bids in the usual manner and obtained samples from each manufacturer, with the result that the brick was obtained from a different source at a saving of \$210.

8. An institution specified a certain brand of floor oil, which it was claimed was non-flammable. Bidders were requested in the usual way to submit figures and samples. The latter were sent to the state testing engineer for analysis, where it developed that the oil specified, costing \$1.20 per gallon, was of no better quality and just as inflammable as an oil produced in California which was offered to us at 25 cents per gallon. On this particular order \$57 was saved, but the test was worth much more than this as its results were useful in making subsequent awards.

9. Another institution endeavored to obtain our confirmation of the purchase of a meat slicing machine made by them from an itinerant salesman. The price charged was \$37.50 and the institution claimed that the machine was well worth that amount. On obtaining a full description of the machine, we refused to confirm the purchase as it

was found that the same equipment could be obtained from Coast dealers for \$19.75. The institution took the matter up further and as a result the itinerant vendor agreed to accept the latter amount as settlement in full, and we then gave our approval to the transaction. In this particular instance the saving amounted to over 47 per cent.

10. Foreseeing what the nail situation was going to be, due to labor, fuel and transportation conditions, we purchased several hundred kegs of nails and as a result both the State Department of Engineering and institutions have been well taken care of and no construction work of any kind was retarded for lack of nails. We have saved several hundred dollars on the price of nails alone as there has been a general advance since our first purchase at \$5.80 per keg base, whereas the present base price is \$6.45 per keg.

11. We were advised of an overstock of garbage cans by one of the jobbers and were offered them at an attractive price, saving about \$100 on the lot.

12. The Engineering Department requisitioned for a large quantity of steel cable to use in revetment work. Price on new cable was at that time \$120 per ton. We succeeded in locating 10 tons of slightly used cable answering the purpose just as well as the new, which we purchased at \$20 per ton, saving \$1,000 on this item.

13. One institution using a high grade carbon steel had been paying seventy cents per pound for the same, but on obtaining samples and going into the Eastern market we purchased a steel answering the same purpose at a price of $15\frac{1}{2}$ cents per pound, a saving of \$545 on a 1000 pound order.

14. We had an opportunity to purchase 2000 dozen men's jersey ribbed underwear from the government stores at \$8.73 per dozen. We bought this in advance of our needs as the market price was \$12.92 per dozen on the same grade of goods. We made a saving of more than \$8,000 on the purchase.

15. Another 2000 dozen men's underwear, heavier weight, was purchased later at \$12.75 per dozen; the same underwear is now worth \$13.50 per dozen. We made a saving of \$1,500 on this lot.

16. In July, 1920, we purchased 10,000 yards of $\frac{6}{4}$ brown pequot at a special price of 57 cents per yard. The New York market price at the same time was 64 cents. A saving of \$1,300 was made on this purchase.

17. With the present price of material for shirting 46 cents a yard, requiring $3\frac{1}{2}$ yards to make a shirt, plus the cost of buttons, thread and labor, the total cost of shirts made at an institution is at least \$21

per dozen. We picked up a lot of 65 dozen shirts of the same material at \$13.50 per dozen or a saving of \$450 on the lot.

18. We purchased at an auction sale 28 dozen caps of various colors and patterns at \$11 per dozen. The same cap could not be purchased from the wholesaler at less than \$18 per dozen. We made a saving of \$198 on the lot.

19. An institution sent in a requisition for 800 yards of curtain swiss. They also sent a sample of the material they wanted and the price they had obtained was 30 cents per yard. We bought for them the identical pattern and quality at 25 cents per yard.

20. We recently purchased 300 dozen Winsted socks for one of the institutions at \$3.50 per dozen. The present price on an inferior quality is \$4.50 per dozen.

21. In the fall of 1919 the federal government offered reclaimed 4-pound wool blankets at \$5 and new blankets, same weight at \$6, containing 80 per cent wool. The general price obtained on a similar blanket in the open market was from \$6.50 to \$7 each. We bought and billed to the institutions a 4½-pound blanket, 80 per cent wool, at \$5.79 each.

22. We had orders from various institutions for shoes. The best price San Quentin could make the shoes for was \$6 per pair. The best price we could obtain on the outside was \$6.50 for the shoe desired. We succeeded in locating a thousand pair in the government stores which we bought at \$3.43 per pair.

23. We purchased a quantity of sporting goods for the schools at 20 per cent less than the price received from the wholesale sporting houses.

24. The institutions use quite a quantity of leather working gloves. We had an opportunity to secure 60 dozen pair from an auction house at an average of \$9 per dozen. The lowest price obtainable from the regular sources on the same glove was \$15 per dozen. We made a saving of \$360 on this lot.

25. A decline in the price of sheeting was expected in September. We had, already purchased and on hand in our stores, about one-third of the quantity asked for for the three months' period. We partially filled the orders from this one-third supply and deferred buying the balance until after the decline, thus saving from 20 to 25 cents per yard on the same.

26. The best price San Quentin could make on men's suits for institutions was \$21 each. We had requisitions for suits from a number of the institutions and we purchased from an auction house one lot of 200

suits, excellent quality, well made, for \$14 each, being \$7 less than we could purchase the same suit for at San Quentin.

We purchased another lot of 60 suits from another auction house for the Preston School of Industry at an average of \$15 per suit, saving over San Quentin's lowest possible price \$6, or \$1,760 on the two lots.

27. We advised the pharmacists at the various state institutions to make their own tinctures, extracts, etc., because the state was buying tax-free alcohol, thus saving the state not only the \$6.50 per gallon on the alcohol used in making the tinctures and extracts when they were buying them from the wholesale pharmacists, but at the same time making a saving on the wholesale price.

28. In November, 1918, we bought 2000 yards Wilton velvet carpet for distribution to various departments, paying cash and securing it at \$3.05 per yard. In February, 1919, we bought another 2,000 yards at the same price. The wholesaler's price per full roll was at these times \$3.675 per yard—a saving accomplished of $62\frac{1}{2}$ cents per yard on 4000 yards, or \$2,500.

29. By buying sugar in large quantities and paying cash therefor from our revolving fund within seven days after delivery, we are able to purchase direct from the refineries and thus save the state the profit heretofore paid to the jobber, which is 50 cents per hundred and also get the cash discount of 2 per cent. This makes a net saving, when sugar is selling at the refinery at \$11 per hundred, of approximately 72 cents per hundred.

The state uses during a year approximately 700,000 pounds of sugar. A saving by our method of 72 cents per hundred on 700,000 pounds amounts to \$5,040, to say nothing of what may be saved at times by taking advantage of the change in market price.

30. The lowest price secured from the wholesaler on evaporated apples for a quarter's supply was $10\frac{1}{2}$ cents. We secured a supply from a producer, same grade, at 8 cents and saved the state $2\frac{1}{2}$ cents per pound on 17,000 pounds, or \$425 on the lot.

And so we could continue giving page after page of instances of saving accomplished by the department in all lines of merchandise by reason of our knowledge of conditions, markets and sources of supply.

We have given these few examples so that you might be informed of some of the many ways in which the state is benefited by the work of the Purchasing Department.

THE FUTURE FROM THE STANDPOINT OF VALUES AND RECOMMENDATIONS OF IMPROVEMENTS IN THE CONDUCT OF THE STATE'S BUSINESS AS I SEE IT.

I would not for a moment attempt to convey the impression that I can predict the trend of future prices with unerring judgment. I can only express my opinion based upon past experience and general information gleaned from many sources. The World War caused such an upheaval and displacement in all lines of human endeavor that the whole financial and business interests of the world have been endeavoring for the last three or four years to find a foundation of facts upon which they could safely base their plans for future business. The changes in all lines and conditions were of such stupendous proportions that there were no past experiences by which these changes could be measured. The resources of the world in men and materials had been diverted and ruined to an extent beyond the ability of the brightest minds to grasp.

Twenty-five million of the world's workers who had been engaged in producing the materials needful for the world's comfort and pleasure were removed from that peaceful occupation and were employed in the work of destroying for a period of three or more years. Add to this the probable one hundred million more world workers who were engaged in feeding the great war machine and we have some conception of the magnitude of the readjustment necessary upon the cessation of the war and the turning of these forces back into the regular tasks of life.

This readjustment during the past two years has only begun. It will take a long time to get down to a normal basis. It will be years before we shall have again reached a degree of production equal to the demand. We can expect no very marked decline in prices so long as production lags behind consumption. The wage earners must come to a realization that the reduction in the cost of living is not dependent upon "How much will I get for what I produce" but upon "How much can I produce for what I get." The reduction of prices, therefore, will be gradual, except here and there an article, which by reason of circumstances applicable to that commodity alone, may be subject to rapid decline; and it will be years, if ever, before we see commodities as low as they were at the beginning of the World War.

The decline will be much less rapid than the increase. This has been the history of every after-war period.

The decrease in general prices began about July, 1920. In California foodstuffs were the first to begin the downward movement, then clothing; next will be footwear, drugs and apothecary goods; metal and

metal products will be the last to feel the effect. We probably will not have a decline of more than 35 per cent during the first year after the general turn which began July, 1920. The second year will probably show an average decline of 15 to 20 per cent and each succeeding year a proportionate less average decrease until the new permanent price level has been reached.

Improvements in Methods. Considerable improvements in the promptness with which the state pays its bills have been made in the past two years. A good beginning has been made and there have been expressions of commendation from many of the merchants and manufacturers of that improvement, but we are not yet meeting the state's obligations as promptly as we should, considering that the funds are provided in advance for such payment. This is due in part to inefficiency caused by so much unavoidable change in personnel and cumbersome and round-about routines. There is also much duplication of work and function. Fewer duplications would save the state expense and speed up the transaction of the state's business.

We hope, with the approval of the Board of Control, to be able to enlarge the store activities and for this purpose shall establish a division of stores and distribution. We should have in San Francisco a store room much larger and more commodious than the one we now have, and it should be entirely separate from the buying and store of the Harbor Commission. With adequate store facilities we could carry many lines of staples which are not perishable and thus not only standardize more thoroughly in many lines, but enable us to buy in jobbing quantities, securing the best possible prices and terms and to render the institutions more prompt and efficient service, as well as giving them the benefit of larger quantity prices.

We hope in the near future to place a representative of this Department permanently in Los Angeles, in order that we may get in closer touch with the business men of the southern city as well as secure more satisfactory deliveries. There should, therefore, be set aside for our use two rooms in the building provided for the state offices in Los Angeles, one for office, the other for store.

The overhead cost of the stores division should be taken care of by adding a fixed per cent to the actual cost of the merchandise sufficient to cover the expense of distributing. By this means the revolving fund would earn a surplus which should be used in defraying the expense of distribution and in this manner the cost would be borne by the departments participating in the benefits instead of being added to the cost of buying as it is under the present plan.

There should also be established, in connection with the Purchasing Department, a salvage division for the disposal of all obsolete equipment and non-usable material. The Purchasing Department is the one organization of the state service whose business is to buy and sell merchandise of all kinds and by reason of being in that game continually is familiar with markets and prices, hence the logical place to handle the disposal of old stocks. Where an institution has a quantity of old material to be disposed of it should send to the Board of Control a "request for sale" form enumerating and describing the material, giving its original cost, condition, term of use, etc. If the Board of Control approves of the need for disposal the approved "request for sale" form should be turned over to the Purchasing Department. This Department should investigate the condition and offer for sale and sell for the best terms possible and render an account of sale with net proceeds of same to the original owner, after deducting the legitimate expenses incurred in making such sale. I believe that in this manner the state institutions could realize much more from the sale of junk and obsolete equipment than has been realized in the past, and a perfect history of every transaction would be available for check by the auditing bodies.

I believe most thoroughly that a proper and very careful check should be kept on every delivery of merchandise or material made to the various state institutions, but I am also thoroughly convinced that much needless waste of good material as well as considerable unnecessary expense is incurred by useless sending of certain classes of materials to technical testing laboratory which do not need technical examination to determine whether they are acceptable deliveries or not, but should be determined by the examination and judgment of those in charge of these materials at the institutions.

Any intelligent storekeeper, commissary or business manager, when in possession of a copy of the specifications upon which material is bought, ought to be able to determine whether or not the delivery is equal to the specifications on such merchandise as beans, dried fruit, whole grains, various kinds of cereals, and other commodities such as rolled oats, oat meal, rice, salt, oysters, canned fruit, canned vegetables, dried peas, tapioca, sago, corn starch, crackers, macaroni, etc., etc.

It seems to me that the sending of samples of such common everyday food articles, with which almost every man and woman in the ordinary walks of life are familiar, to a pure food and drug laboratory for judgment, is not only a needless expense but a downright waste of material which could and should be avoided.

Take the canned fruit and vegetables; the large institutions use mostly the gallon size and they use several varieties, yet some of them

send a sample can from every delivery to be passed upon by the laboratory. The contents of the can which is worth from 50 cents to \$1 each is lost besides the expense of sending.

I claim that there is no need of sending a sample of many of these items to be tested unless the one in charge at the institution, upon proper examination, has a doubt as to the quality and hence wishes the judgment of the pure food officials.

Bear in mind however, that I am not questioning the wisdom or necessity of sending to the technical laboratories, samples of all deliveries requiring a technical analysis to determine as to their adulteration or their conformity to the Pure Food and Drug laws. This is necessary. I am only questioning the custom of sending samples of the ordinary materials, the quality of which can be accurately and certainly determined without the aid of technical chemistry laboratory work.

Delivery of Merchandise After Order Has Been Placed. When the Purchasing Department places an order with a firm a copy of that order is sent to the institution or department. This copy shows on its face the full description of the merchandise, the price and the terms of delivery. It thus becomes the duty of the one in charge of the stores of the institution or department to report to the Purchasing Department any unusual delay in filling the order, or an unsatisfactory delivery on the order.

Every copy of order gives the date on which the firm has agreed to deliver. These copies of order should be placed on file and if delivery is not checked on copy within a reasonable time after date agreed, the Purchasing Department should be notified, so that they could take it up with the firm and secure action.

It frequently happens that these orders are allowed to remain on the institution's files for weeks and no report of non-receipt is given the Purchasing Department, when suddenly the institution wakes up to the fact that they are in immediate need of some kind of merchandise and very often have to procure an emergency supply, because the deliveries have not been carefully followed up by the storekeeper or commissary at the institution. Ninety per cent of these troubles could be avoided by proper and systematic attention to details.

Adjustment of Errors, Shortages and Differences in Payment of Bills. We are continually receiving letters from merchants asking us why certain payments from departments are short of amount of the invoices, or why invoices of long standing are not paid, while those of later date have been paid.

Every bank check used by an institution or department should be a voucher check, or in other words should have a voucher stub attached

on which should be enumerated the date and amount of every invoice the check is intended to cover. It also should contain memoranda of every deduction or correction made on such invoices. Invoices should also be paid according to their dates, paying them in the order in which they become due. Even our Division of Stores' bills covering the merchandise which we ship to the departments are paid by them in such a manner that it at times almost necessitates the employment of an extra clerk to ascertain what part of their account they are attempting to pay; hence, we have first-hand knowledge that the complaints from merchants are justifiable. These difficulties could and should be remedied. The fact that this is the great State of California does not justify any department in making arbitrary deductions or corrections in any firm's invoices, even though the deductions or corrections are justifiable, *without the courtesy of an explanation*. We are doing business with the *public*, for the *public*, therefore, the *public* is entitled to every courtesy and consideration consistent with fair dealing.

In my last report I called attention to the need of a central commissary building at San Quentin. This need still exists and its establishment would be a great assistance in handling materials purchased for them.

I also point out again the desirability of centralizing the various testing laboratories and their equipments and employees into one laboratory, located at the Ferry Building, in San Francisco. We have been trying to effect such an arrangement for a long time but the Purchasing Agent can only suggest. We lack the necessary authority to make our suggestions effective where the suggestion would necessitate a change in the routine followed by some other department. If the Board of Control, which is recognized as one of the sources of authority, would instruct the departments interested to cooperate in such an arrangement, it could, without doubt, be speedily accomplished and would work for both economy and efficiency in the matter of testing materials.

The State Purchasing Department as the buying agent for all the state institutions and departments recognizes that it was created to serve all the state departments, and it has at all times endeavored to serve them to the best of its ability. We have tried to secure for them the merchandise best suited to their requirements for the least price possible. We have recommended to them at times changes and substitution where we thought it was for their best interests. On some occasions we have delayed purchase of large items when such delays would not be seriously detrimental to them when our knowledge of the markets has indicated to us that considerable saving could be made by such delay.

At no time have we made arbitrary changes, but have advised and co-operated with the departments to the fullest extent. We have, without exception, received the hearty cooperation of every department of the state in our efforts toward economy and efficiency. The past four years have been very trying to all of the state departments, from the fact that we have all been trying to make one dollar do the work of two, but we are expecting confidently that the coming two years are going to relieve the tension and make it somewhat easier to make the appropriations meet the demands.

We trust that the report of our work as outlined in the foregoing is entitled to your commendation.

Most respectfully submitted.

W. G. McMILLIN,
State Purchasing Agent.

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ANNUAL REPORT

OF THE

California Stallion Registration Board

FOR THE

YEAR ENDING JULY 31, 1919



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO

1919

STALLION REGISTRATION BOARD, 1919.

DIRECTORS.

GEO. C. ROEDING.....*President*

DR. J. P. IVERSON.....*State Veterinarian*

CHAS. W. PAINE.....*Secretary*

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SEC. 10. Every association, person, firm or corporation violating any of the provisions of this act, shall be guilty of a misdemeanor, and shall be punished by a fine not exceeding one hundred dollars (\$100) for each offense; or by imprisonment in the county jail not exceeding fifty days, or by both such fine and imprisonment.

LETTER OF TRANSMITTAL.

CALIFORNIA STALLION REGISTRATION BOARD,
SACRAMENTO, JULY 3, 1919.

To Honorable WILLIAM D. STEPHENS,
Governor of California.

SIR: We have the honor to submit herewith our eighth annual report, in accordance with the provisions of chapter 677, entitled "An act to regulate the public service of stallions and jacks in the State of California."

This report covers the period of July 1, 1918, to June 30, 1919, and contains a financial statement showing the receipts and disbursements of the board for the above period and a statistical summary showing the number and breeds of the stallions in each county in the state.

Respectfully submitted.

GEO. C. ROEDING, *President.*
DR. J. P. IVERSON.
CHAS. W. PAINE, *Secretary.*

FINANCIAL STATEMENT.

July 1, 1918, to June 30, 1919.

SUMMARY.

RECEIPTS.

Cash balance, July 1, 1918		\$2,051 02
Amounts received for:		
New licenses issued	\$173 25	
Renewals issued	668 75	
Transfers issued	71 25	
Fees received and refunded	2 50	
Received and no license issued	14 75	
		930 50
		<u>\$2,981 52</u>

DISBURSEMENTS.

Office salaries	\$1,221 00	
Field salaries	150 00	
Traveling expense	12 50	\$1,383 50
Prizes, 1918 Fair		230 00
Stationery and printing		193 19
Postage		175 00
Trophies, 1918 Fair		127 50
Refunds		2 50
License tags		52 25
Association fees		5 00
Cash balance June 30, 1919		812 58
		<u>\$2,981 52</u>

THE DRAFT HORSE.

By CHAS W. PAINE, Secretary Stallion Registration Board.

The future of the draft horse in California at the present time presents a serious question. Our records show that in 1912, there were registered 2,034 stallions and jacks, and in 1919 to the present time, July 1, there are only 583 licensed.

It is true that the greatest decrease in number has been among the mongrels, showing that we are raising better colts, but if we look into the matter seriously I am quite sure that the farmers and breeders are making a great mistake in letting this industry go by default.

Just when the death knell of the horse was first sounded is rather hard to discover, but there is a story to the effect that when young Stephenson first rigged up a steam engine on wheels with the avowed intention of making a self-propelled vehicle, an old Scotch breeder of Clydesdales visited the youthful inventor and threatened him bodily harm if he did not cease working on a machine that was calculated to supersede the horse.

Then came the cable cars, and then the electric trolley, and finally the automobile, the truck and the tractor. With the advent of each the prophets rang down the curtain on the horse.

Let us examine the facts of the case. In 1880 the United States had a population of 50,155,783, and a horse population of 10,357,488, or a ratio of less than one to five. In 1890, we had a population of 62,947,714 and 15,266,244 horses—a trifle over four to one. In 1900 there were 75,994,575 people and 16,952,191 horses—not quite four and one-half to one. In 1910 the population was placed at 91,972,266, and the number of horses at 19,220,338, a ratio of not quite five to one. The most recent figures give our population at considerably over 100,000,000, and on January 1 there were 21,126,000 horses on American farms.

A further investigation discloses the fact that in 1880 there were 4,088,907 farms on which the 10,357,488 horses were slightly over two and one-half horses per farm. In 1900, less than three horses were owned on the 5,737,372 farms. In 1910 we find a few more than three horses per farm. No figures showing the number of farms in the United States, January 1, 1917, are at hand, but it is safe to say that the ratio has been cut down since the beginning of the war, but to what extent we can not say. It does not seem possible that this ratio can be decreased to a very great extent or there would be few, if any, left. The above figures do not take into consideration the mules owned on farms; however, there has always been less than one mule per farm.

I must say that the tractor is in successful operation on many large farms and ranches, and the popularity and efficiency of the tractor is

bound to increase and will displace the horse where it is demonstrated to be more economical. But with the above figures in mind there does not seem to be any reason why draft horse breeders should become panic stricken.

Some will say that the figures I quote are all very true, but I am overlooking the fact that in the past the cities have been the outlet for surplus horses and it is a well known fact that the trucks are displacing many horses. During the past few years a great many firms sold their horses and purchased trucks, but a great many of the same firms will turn back to horses because of their demonstrated ability to handle a short haul more economically.

But there is a wider market to look to. Statistics for 1914 give the horse population of the world as 95,698,000. Russia, with 24,639,000, is the only country with more horses than the United States. Germany had 4,523,000, Austria-Hungary 4,374,000, France 3,231,000, the United Kingdom 2,233,000, Italy 956,000 and Canada 2,948,000.

No figures are available to indicate the extent of the depletion of the horse stock of Germany, France, England, Russia, and Italy, but it goes without saying that the loss has been terrific and that the end of the war will find the warring nations facing a marked shortage of horsepower. The United States, Russia and the Argentine are the three sources of supply. The native horse of Russia is a small pony-sort of horse, likewise the native Argentine horse is small. The United States is therefore the only country in the world that is in a position to furnish Europe with horses approaching the type that is certain to be in demand when the rehabilitation of Europe begins.

It is said that it takes 35,000 horses and mules each month to replace the foreign losses and with our country at war it will require 11,000 horses and mules per month to keep our army of 2,000,000 supplied. In other words, after our army is in the field, 46,000 horses and mules will be taken from the country per month.

From any viewpoint, the future of the draft horse seems assured, and farmers and breeders will have lost a golden opportunity in not breeding every available mare to a good sound draft stallion at this time.

Twenty-five per cent of our soldier boys will want to go to the farms at the close of the war. Will we have the best kind of a horse ready for them when that time comes?

The draft horse is the finest type of horse, and the draft mare has a double capacity. She is self-reproducing motor power and contrary to the tractors, she is self-repairing to a very appreciable degree. Fuel power for the horse can be raised on the farm, while that of the tractor must be purchased on the outside.

In our state the buyers for our Government and the Allies have purchased all available horses and at the present time the price for geldings in Europe is quoted at between \$800 and \$1,000 per head. There is no reason why such prices will not prevail here in the very near future and it behooves, as I have said, every breeder to raise every colt possible.

The California Stallion Registration Board has endeavored in every way, this year, to encourage the breeders and I am sorry to say from our records our efforts have not been successful.

EIGHTH ANNUAL REPORT

OF THE

CALIFORNIA STALLION REGISTRATION BOARD

Within the past twelve years twenty-three different states have passed laws requiring that all owners of stallions or jacks, before standing them for public service, shall obtain a license for each animal from the state board created for that purpose. The board examines all pedigree certificates and veterinarians' certificates of soundness submitted, and enrolls and issues license certificates and tags for all stallions and jacks entitled to such enrollment in accordance with the law. Such legislation has been enacted in the following states:

States	Act effective	States	Act effective
Wisconsin	Jan. 1, 1906	Kansas	April 3, 1910
Iowa	Mar. 30, 1907	Washington	June 8, 1910
Minnesota	April 25, 1907	Oregon	May 20, 1911
Utah	May 13, 1907	Nebraska	July 7, 1911
Pennsylvania	Jan. 1, 1908	California	Aug. 1, 1911
New Jersey	Sept. 1, 1908	Michigan	Aug. 1, 1911
Montana	Mar. 8, 1909	Colorado	Aug. 5, 1911
South Dakota	Mar. 9, 1909	Oklahoma	Feb. 25, 1915
Idaho	Mar. 15, 1909	New York	Aug. 1, 1916
Indiana		Missouri	Jan. 1, 1918
Illinois	Jan. 1, 1910	Ohio	
North Dakota	Jan. 1, 1910		

The details of these laws vary somewhat in different states, but all are more or less founded on the Wisconsin act, which was the pioneer state in this matter, but all require the submission of certificates of registration in studbooks certified by the United States Department of Agriculture, as evidence of the purity of breeding of stallions licensed as purebred, except that some provide in addition that stallions shall be accepted as purebred which are registered in studbooks of any American studbook or registry association which recognizes and records stallions having five pure top crosses.

That the state stallion law marks a distinct step in advance in our horse-breeding industry is hardly to be questioned. One of the first results of the operation of these laws was to provide data which show the actual facts with regard to the stallions being used for breeding purposes. Other important beneficial results are the rapid elimination of unfit animals and greater care with regard to breeding and registration. Under authority of paragraph 492 of the act of Congress, approved August 5, 1909, the following regulations were issued by the United States Department of Agriculture regarding the importation of animals for breeding purposes, in order to prevent fraud concerning the ancestry of purebred animals, which became effective on February 1, 1912.

RECOGNIZED FOREIGN BREEDS.

The following breeds of horses have been certified to the Secretary of the Treasury as recognized breeds and books of record across seas:

Name of breed	Book of record	By whom published
Belgian Draft -----	Studbook des Chevaux de Trait Belges-----	Societe le Cheval de Trait Belge, Chevalier G. Hynderick, secretary, 20 Rue Royale, Brussels, Belgium.
Clydesdale -----	Clydesdale Studbook -----	Clydesdale Horse Society of the United Kingdom of Great Britain and Ireland, Archibald McNeillage, secretary, 93 Hope Street, Glasgow, Scotland.
French Draft -----	Studbook des Chevaux de Trait Français.	Societe des Agriculteurs de France, J. C. Villevas, secretary, 8 Rue d'Athenes, Paris, France.
Hackney -----	Hackney Studbook -----	Hackney Horse Society, Frank F. Euren, secretary, 12 Hanover Square, London, W., England.
Percheron -----	Studbook Percheron de France-----	La Societe Hippique Percheronne de France, E. Lemarie, secretary, Nogent-le-Rotrou, France.
Shetland Pony -----	Shetland Pony Studbook-----	Shetland Pony Studbook Society, R. W. Walker, secretary, 3 Golden Square, Aberdeen, Scotland.
Shire -----	Shire Horse Society Studbook-----	Shire Horse Society, J. Sloughgrove, secretary, 12 Hanover Square, London, W., England.
Suffolk -----	Suffolk Studbook -----	Suffolk Horse Society, Fred Smith, secretary, Rendlesham, Woodbridge, Suffolk, England.
Thoroughbred -----	Australian Studbook Provided that no animal or animals registered in the Australian Studbook shall be certified as purebred unless such animal or animals trace, in all crosses, to animals registered in the General Studbook of England. General Studbook -----	Australian Jockey Club and Victoria Racing Club, A. P. Wilson, keeper, 6 Bligh street, Sidney, New South Wales.
Welsh Pony and Cob-----	Welsh Pony and Cob Studbook-----	Weatherby & Sons, 6 Old Burlington street, London, W., England. The Welsh Pony and Cob Society, John R. Bache, secretary, Knighton, Radnorshire, Wales.

Recognized breeds and books of record in Canada.—The Canadian National Records are recognized for the following breeds, provided that no animal or animals registered in the Canadian National Records shall be certified by the Secretary of Agriculture as purebred unless such animal or animals trace, in all crosses, to registered animals in the country where the breed originated, or to animals which are proved to the satisfaction of the department to be of the same breed and which have been imported from the country in which the breed originated:

Belgian Draft.	Standardbred.
Clydesdale.	Suffolk.
Hackney.	Thoroughbred.
Shire.	Welsh Pony and Cob.

The complete act to regulate the public service of stallions and jacks in California is given in full in Appendix D, as it will be found useful for reference by those concerned.

In Appendix B the various breeds are given in detail, and the numbers are of considerable interest. No pony stallions have been registered.

The total number of registered stallions in the state is 435, principally classified as follows:

Mongrel, 87; Percheron, 140; Standard, 21; Belgian, 38.

The four leading counties are San Joaquin, with 22; Tulare, with 20; Los Angeles with 15; Fresno, with 12.

SUMMARY.

Breed	Number							
	1912	1913	1914	1915	1916	1917	1918	1919
Arab			1	3	5	5	3	3
Belgian	146	159	138	143	114	98	77	54
Cleveland Bay	1	1						
Clydesdale	29	33	25	22	16	9	8	6
Crossbred	10	6	2	2	3	4	4	3
French Coach	26	23	21	10	8	5	4	
French Draft	57	57	48	46	36	29	22	15
German Coach	65	53	29	32	22	13	7	7
Hackney	2	4	3	3	2			
Mongrel	766	707	547	350	288	209	115	87
Nonstandard	2	4	3	4	3	3	2	1
Norman	3	5	4	2	1			
Percheron	419	463	410	437	391	328	247	179
Saddle	10	7	8	10	9	8	5	2
Shire	94	88	71	72	66	46	36	28
Standard	165	279	208	186	144	75	42	31
Suffolk	1	1	1	1				
Thoroughbred	11	15	8	13	16	17	13	14
Trotter	150	2						
Welsh Pony								
Not classified		13	24		9	9	5	5
Totals	1,957	1,920	1,552	1,336	1,133	858	590	435
Jacks	77	358	111	295	254	185	173	148
Grand totals	2,034	2,278	1,663	1,631	1,387	1,043	763	583

The decrease in the number of stallions licensed is more noticeable in the mongrels, which shows that the stallion law has had its effect for the betterment in breeding.

While the extensive use of the automobile and traction engine has no doubt been the primary factor in this large decrease, yet, on the other hand, the published graded registration of the California Stallion Registration Board has had a tendency to promote better breeding, thus carrying out the purport of the law.

STALLION REGISTRATION BOARD.

GEO. C. ROEDING.

DR. J. P. IVERSON.

CHAS. W. PAINE.

DESCRIPTION OF DISEASES ENUMERATED IN THE STALLION LAW.

A brief description of the diseases referred to in the California law is given below. This is not offered as a complete treatise, but only such features are mentioned as is thought will be of interest and assistance to persons especially concerned.

Periodic Ophthalmia—Moon Blindness.

This is a disease affecting the eyes of horses, probably caused by a germ. It is quite commonly called moon blindness because it was thought at one time that the moon had some influence on the cause of the disease.

There is undoubtedly a hereditary predisposition to the disease, but there are few cases to indicate that the disease itself is transmitted from parent to offspring, but rather the colt is born with a weakness of the eyes, transmitted by the stallion or dam. Other predisposing factors are low, damp (swampy) pastures, poorly ventilated or insufficiently lighted stables, over-feeding, etc.

The disease comes on with an inflammation usually of one eye. The transparent portion of the eyeball becomes bluish or white in color, most noticeable in the lower part (precipitate in anterior chamber). The eye is kept half closed on account of pain produced by light. Often this is associated by a swelling of the eyelids and reddening of the membrane lining them with a discharge of tears over the face. There is no indication of an injury or more severe inflammation at one point than at another. In one or two weeks these symptoms disappear and the eye may be practically normal to all general appearances for a period of usually one to three months, when another attack occurs more severe than the first. After a few attacks have come and gone the eye has a bluish appearance, looks cloudy instead of clear, the eyeball is shrunken, retracted in the orbit and the lens (inside of eyeball) become white (develops a cataract). Not being satisfied with having destroyed one eye the disease frequently affects the other and the history of the first is repeated.

Cataract—Opacity of Lens.

Immediately back of the covering the pupil of the eye is the lens. It is ordinarily not noticed because of its being transparent. Where it becomes clouded (opaque), however, the opaque portion is readily seen. As a rule, cataracts soon involve the entire lens and the pupil then looks white, or grayish in color. There are many different classifications of cataract, as congenital, senile, primary, secondary, capsular, traumatic, etc., but as no distinctions are made in the law, the different kinds will not be discussed specifically.

Roaring (Laryngeal-Hemiplegia).

A paralysis, either partial or complete, of one or both recurrent laryngeal nerves. The most frequent causes of roaring are undoubtedly infectious diseases, such as strangles and influenza, and various forms of pneumonia. Heredity probably plays some part as a causative agent and for this reason the condition when present constitutes an unsoundness in stallions.

Paralysis of the recurrent laryngeal nerve leads to disuse of the muscles which tense the vocal cords. Looking into the larynx from in front, these cords can be seen to be stretched across the larynx from above to below, while between the cords and the sides of the larynx are two blind pouches or pockets, the lateral ventricles. Looking into the larynx from behind, the walls are smooth and unobstructed. During normal respiration the vocal cords are drawn to the sides of the larynx and the ventricles closed on inspiration, while on expiration they swing out into the larynx somewhat. In roaring, the cord or cords being paralyzed, hang more or less loosely in the larynx during inspiration and the air rushes into the ventricles.

The most striking symptom, therefore, is a laryngeal sound made on inspiration only. The sound varies from a whistling to a dull roaring, depending upon the

degree of paralysis, and also varies greatly in intensity from one which is barely perceptible only when the horse is being exercised to one which is so severe that the least movement or excitement may produce very distressing symptoms.

The two symptoms which are the most characteristic of roaring, therefore, are that the sound is inspiratory only, and that it is greatly reduced or even entirely ceases within a short time after the animal is brought to rest. The best way of testing a horse for roaring is to put him under heavy draft in soft ground or gallop him in a circle with the head pulled in and turned slightly toward the right.

Navicular Disease.

A chronic inflammation involving the navicular bone, the navicular bursa, and the deep flexor tendon.

In this disease heredity, in so far as it influences quality of bone, quality of tendon and set of limbs, undoubtedly plays an important part. Aside from heredity, any factors such as dry and contracted hoofs, constant fast work on hard roads or pavements, and severe strains, as in running or jumping, must be regarded as causes, as they increase concussion or compression in the navicular region.

Navicular lameness is one of the most insidious with which we have to deal. The broad, flat foot, with large frog and open at the heels, is especially predisposed. The lameness usually comes on gradually and irregularly, resulting in a slow, cautious, short gait, with a constant attempt to keep the weight shifted toward the toe. Stumbling is quite characteristic. The animal usually stands with the affected foot in advance of the sound one, or constantly shifts its weight, if both are affected. There is a total absence of heat or swelling. Pain is increased when the animal is made to stand upon an incline or when pressure is put directly upon the frog. Because the weight is shifted toward the toes, the toes become worn short and the heels become high and contracted.

Great care must be taken not to confuse navicular lameness and shoulder lameness, or simple contraction of the heels, especially when accompanied by thrush.

Sidebone.

A transformation of the lateral cartilages into bone. The lateral cartilages are placed on the inner and outer sides of the foot, partly above and partly below the hoof head or coronet. Normally, they should be pliable and easily moved from side to side along their upper border by pressure with the thumb.

External injuries and lack of function, especially when accompanied by a low type of inflammation, are the most fruitful causes. Both these conditions are present in a hoof which, due to prolonged lack of frog pressure, has become dry and contracted, thus more freely transmitting shock which constantly comes to a foot in motion, and at the same time limiting movement and keeping up constant inflammation because of contraction of the hoof. An undue amount of body weight in proportion to the size and quality of hoof are also important factors. This is shown by the fact that some horses work upon city streets constantly shod with high calks and never develop sidebones. Therefore, selection is very important.

Sidebones are more frequent in front feet and in the other cartilage of draft horses. The ossification begins on the lower anterior border and proceeds upward and backward until completed. The first change, then, is when the hoof, and though we may be suspicious of its presence, a diagnosis can not be made until an ossified portion can be felt. The chief difficulty arises in examining heavy stallions which have very thick, harsh skin. A diagnosis should never be made until the foot has been picked up and the thumbs inserted deeply behind the cartilage, to detect pliability or the absence of it. As soon as ossification can be definitely determined, sidebones can be said to exist. The presence of sidebone seldom causes lameness in farm animals, but when animals so affected are put to work upon city streets where, because of continued shoeing, the feet become very dry, lameness often results. For this reason, buyers for the city markets object seriously to a horse having sidebones.

Ringbone.

"Ringbone" is an indefinite, collective term for various chronic aseptic inflammatory processes at the coronary joint. It should be divided into two forms, articular, involving the joint, and periarticular, involving the surface of the bone at the attachment of the ligaments around the joints. Ringbones of the first class are the result either of excessive concussion upon the bones of normal quality or ordinary concussion upon bones of poor quality. Ringbones of the second class are due either to excessive straining of the ligaments, due to an unbalanced condition within the foot and limb, or to faulty quality of the bones into which the ligaments are inserted.

It will be seen that the foregoing causes do not include bony growths in this region which result from deep wire cuts or other accidents. True ringbones, then, are the result of lack of quality or faulty formation, and consequently are very objectionable in breeding animals. It is well for owners to understand, however, that excessive strains may result from lack of trimming or faulty shoeing, and ringbones develop as a result.

Ringbone may involve either the first phalanx, the joints between the first and second phalanges, or the second phalanx, and the joint below it; they may be present in either front or hind limbs, though perhaps are found more commonly behind than in front. The most marked symptom is the presence of a bony enlargement on one or both sides or extending entirely around the joint. Care should be taken not to mistake the naturally prominent joints of young animals for ringbone. There is usually no local pain or heat, though lameness is persistent and severe, especially when the joint is twisted, as in turning short.

Ringbone around the lower joint causes a bulging at the top of the hoof and an irregularity in the production of horn, which leaves the hoof surface at the toe checked and cracked. If lameness is severe, the animal stands with the affected foot relieved of weight, or alternately raises and lowers it. The gait is slow and clumsy and marked by lack of movement in the pastern joint.

Bone Spavin.

Bone spavin is primarily a chronic inflammation of the inner lower tarsal bones and upper head of the metatarsal bones. Disease of the accompanying joints and enlargement upon the surface of the bones are secondary processes. In fact, in some spavins (occult spavin) no enlargement can be detected. Bone spavin, therefore, should not be defined as an enlargement upon the inside of the hock joint, as the enlargement is merely a symptom which may be entirely absent.

The usual cause of spavin is undue compression of the bones of the hock, though overstraining is also undoubtedly a cause. Any conformation, such as being too upright or too crooked either when viewed from the side or behind, as well as lack of quality to stand ordinary uses, are predisposing causes. True spavin, then, like true ringbone, is largely a breeder's problem. Although neither is directly hereditary, it is the predisposition in the form of defective conformation or quality which is hereditary.

The recognition of spavin depends upon the determination of a bony enlargement in the hock, if it be present, and an analysis of the lameness. Either may exist without the other.

The enlargement usually is found on the internal lateral surface of the hock. It may be detected by viewing the region from directly in front, looking between the front legs or from a little angle looking, first at one hock, then crossing over and viewing the other, from a similar angle. The hocks can best be compared by palpation by crouching behind the animal, crossing the arms and passing the forefinger of each hand over corresponding surfaces of the two joints at the same time. Any difference in size or contour can then be detected.

Spavin lameness is quite characteristic. It is usually more severe during the first few steps and gradually disappears with exercise, unless the lameness is severe, when it is either constant or increases with exercise. In any case there is

always lack of flexion of the hock and a tendency to drag the toe, which is best seen as the animal is led past the observer. This same lack of flexion necessitates an exaggerated action of the hip, which is best seen from behind as the animal is led away. Again, the animal usually shows pain when turned short upon the affected limb, and lameness is increased by holding the hock flexed for about one minute, and then starting the animal off at the trot.

Bog Spavin.

Bog spavin denotes a serious inflammation of the hock (tibiotarsal) joint. It may be acute at first, originating from a spavin, and finally becoming chronic, or it may be chronic in nature from the first, originating apparently from a congenital (inherited) weakness.

In the first instance there is swelling in the region of the joint, which is firm, painful, hot and causing severe lameness. In the second, more frequent form, there is present a soft, painless, easily compressed swelling, due to distention of the joint capsule, with joint fluid (synovia) which appears most prominently on the inner anterior surface of the joint and can be pushed through to appear on the inner and outer sides behind the joint. The bog spavin which is aimed at chiefly in the stallion law, is the one which is chronic from the first, appearing in the young animal apparently without external cause. The condition can hardly be mistaken from any other, but there is a tendency to excuse slight cases on the ground of being "a little full in the hocks." Whenever there is a distention which can be displaced from one part of the joint to appear in another, the diagnosis of bog spavin should be made, especially in young horses which have not seen service, but old horses which have seen service or have been transported, should not be faulted unless the swelling is hard, hot and accompanied by lameness.

Curb.

Curb denotes an inflammation of the plantar or calcaneo metatarsal ligament, which braces the posterior face of the hock. It is due to an overstraining of this ligament either because of faulty conformation, such as sickle hocks, or to overstraining or slipping while in draft. A swelling appears four or five inches below the point of the hock, over the ligament and confined to it. It is best seen when viewed from the side. There is at first pain on pressure, a slight amount of heat and sometimes lameness.

Chorea.

Chorea is a general term made to include stringhalt, crampiness and shivering. Stringhalt refers to a spasmodic flexion of the joints of the hind leg, especially noticeable at the hock joint. Its cause is not known, but it is thought to be of nervous origin. In mild cases the excessive flexion may be noticed only during the first few steps or upon turning, while in aggravated cases it is marked at each step. Stringhalt should not be confused with interruptions in the act of progression, which are symptoms of some other conditions, such as muscular cramp, bone spavin and inflammation of the stifle joint.

Shivering is purely of nervous origin and is manifested by irregular and involuntary movements, generally most noticed in the hind quarters. The intensity of the symptoms vary greatly, but an average case may show nothing unusual, so long as it does not become excited, but if stopped suddenly, made to back, is led into strange quarters or up to a strange watering place, marked incoordination may take place. The hind feet remain fixed to the ground, the back arched, and the muscles of the quarters tensed, but trembling and shivering. An attempt to raise one hind foot meets with great resistance. The worst cases may be affected with spavin accompanied by rapid pulse, high temperature and distressed breathing.

The course is always prolonged, the condition becomes worse with age and is incurable. Because of these facts and because hereditary predisposition is a strong factor in the production of the disease, it becomes distinctly a breeder's problem.

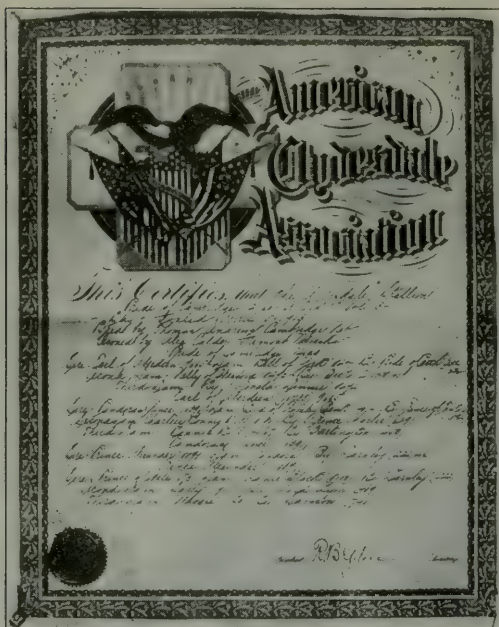
CERTIFICATES OF REGISTRATION RECOGNIZED BY
THE CALIFORNIA STALLION REGIS-
TRATION BOARD.



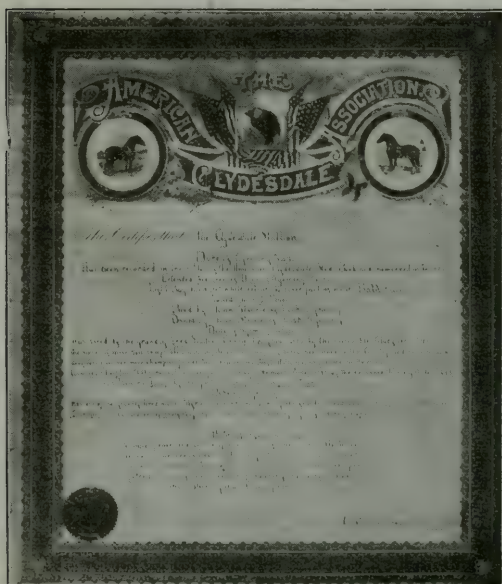
American Trotting Register Association.



The American Association of Importers and Breeders of Belgian Draft Horses
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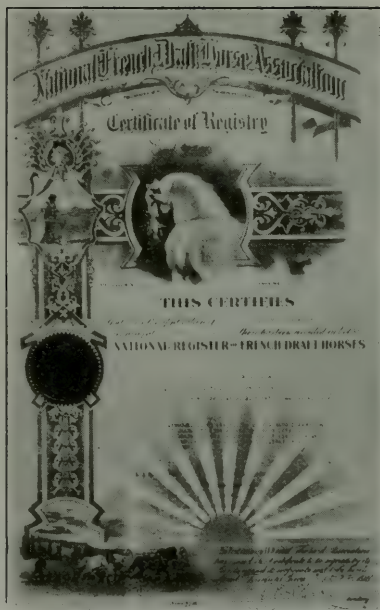
American Clydesdale Association.



American Clydesdale Association.



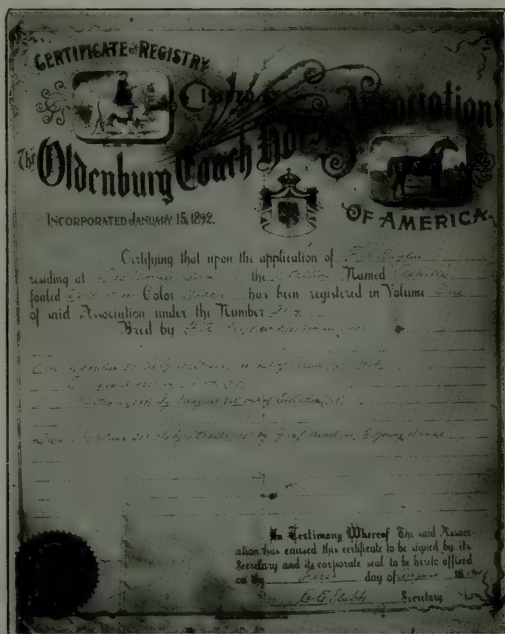
French Coach Horse Society of America.



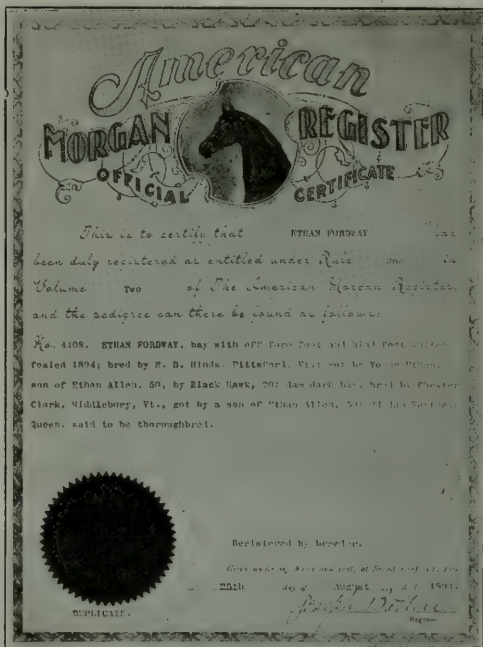
National French Draft Horse Association of
America.



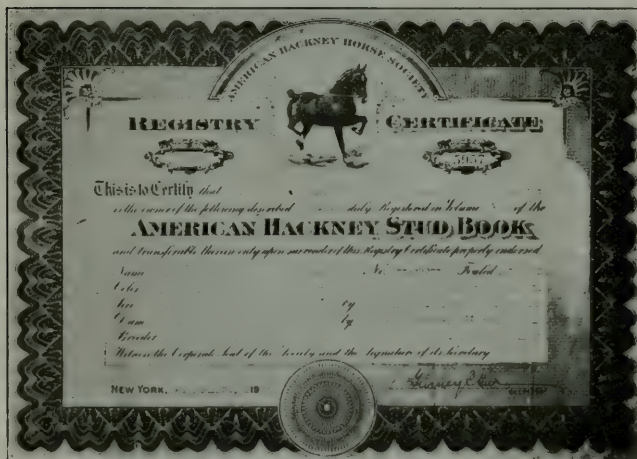
German, Hanoverian and Oldenburg Coach Horse Association of America.



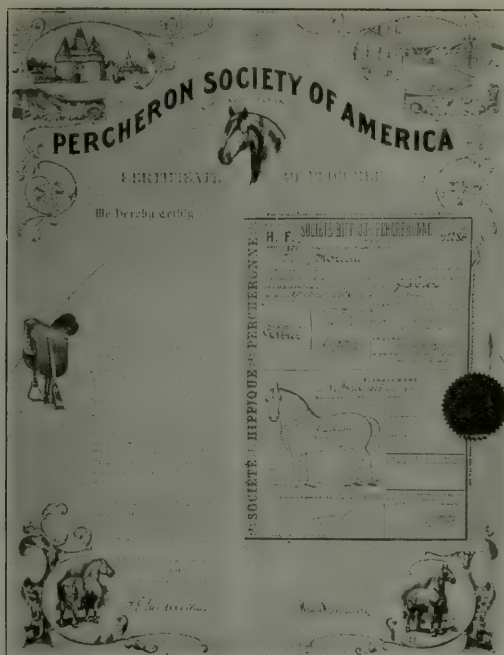
Oldenburg Coach Horse Association. (Now owned by the German Hanoverian and Oldenburg Coach Horse Association of America.)



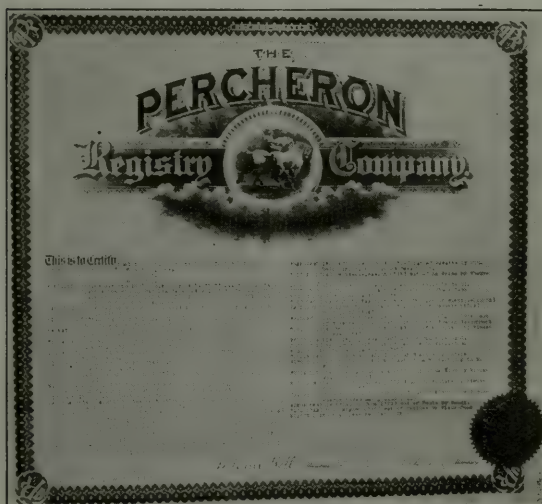
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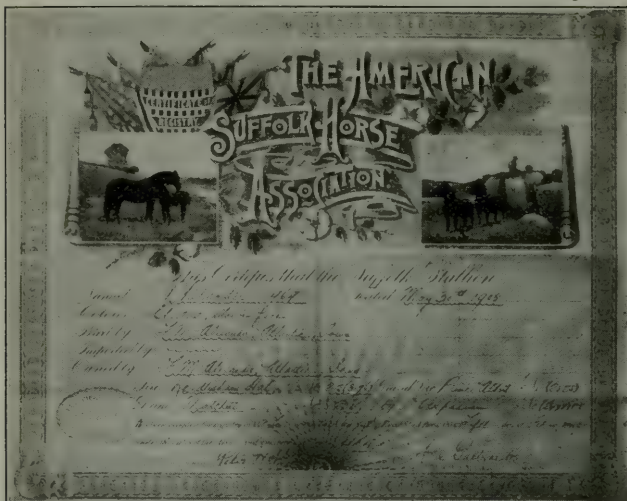
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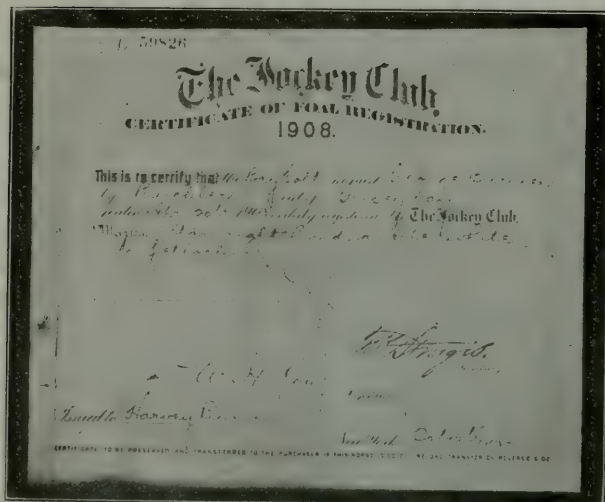
Percheron Society of America.



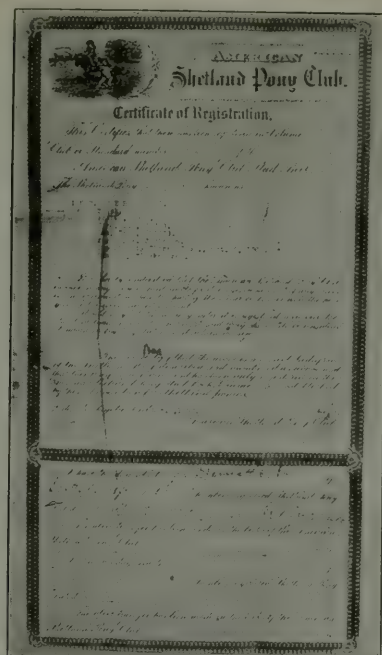
The Percheron Registry Company. (Now owned by the Percheron Society of America.)



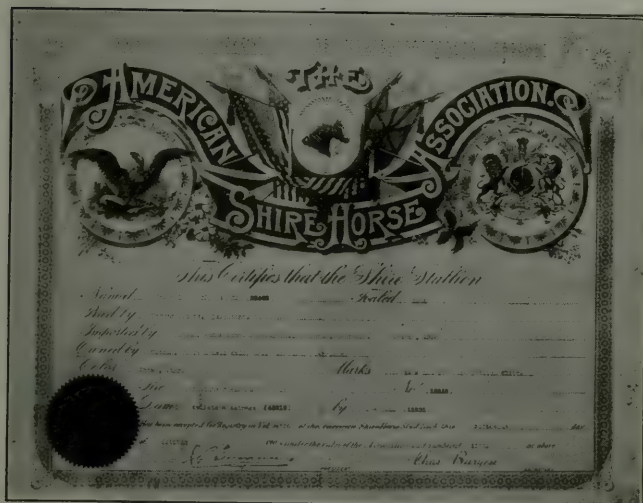
The American Suffolk Horse Association.



The Jockey Club.



American Shetland Pony Club.



The American Shire Horse Association.

American Saddle Horse Breeders' Association
Official Certificate of Registration

This is to Certify, that _____ has been duly Registered in
 The American Saddle Horse Breeders' Register, and the Pedigree can there be traced in
 the following form:

Owned by _____
 P. A. _____
 Address _____
 P. A. _____

Sex _____
 Age _____
 Date of Birth _____
 Name of this Entry _____

Color _____
 Markings _____
 Foal of _____

Place under my hand and seal, at Louisville, Kentucky, this
 day of _____ A. D. 19____

American Saddle Horse Breeders' Association.




The American Breeders and Importers Percheron Registry Company.

THIS BEING CERTIFIED BY U. S. GOVERNMENT

No. _____

American Breeders' Association of Jacks and Jennets

CERTIFICATE



OF REGISTRY

This is to Certify, that the _____ has been accepted for Registry in the American Breeders' Association of Jacks and Jennets, under the rules of the Association and until he numbered as above:

Accepted by _____
 P. O. _____
 Dated by _____
 P. O. _____

Name of this Entry _____
 Reg. No. of Dam _____

Dam _____
 Reg. No. of Dam _____

Sex _____ Color _____
 Markings _____ Points _____
 Foaled _____

Given under my hand and seal, at Columbus, Tennessee, this _____ day of _____ A.D. 1911.

 Secretary

American Breeders' Association of Jacks and Jennets.

The Standard Jack & Jennet Register of America

(INCORPORATED)



CERTIFICATE NO.
 5896

This is to Certify, that NEW LONDON CHIEF JUNIOR,
 has been duly registered and the pedigree can be traced in the following form:

NEW LONDON CHIEF JUNIOR 5896, Jack, Color, black with white points, Height 67, girth 71, bone 10. Foaled October 20, 1906. SIRE, New London Chief by Missouri Chief by Joe out of Julia; Sire's Dam, Miss Tiptress by Young Tiger and out of Miss Briggs. DAM, Ruby II by General Jordan by Fido Hampton out of Crook Girl; 2nd Dam, Ruby by Missouri Chief; 3rd Dam, Jennie Price. Bred and owned by J. T. Watson, New London, Missouri.

In Witness Whereof, the said Corporation has caused this Certificate to be signed by its duly authorized officers and to be sealed with the Seal of the Corporation at Kansas City, Missouri, this Twenty-second day of January, A.D. 1912.

SECRETARY PRESIDENT


The Standard Jack and Jennet Registry of America.

CERTIFICATES OF REGISTRATION NOT RECOGNIZED
BY THE CALIFORNIA STALLION
REGISTRATION BOARD.



American Horse Registry Association.

INTERNATIONAL COACH AND DRAFT HORSE ASSOCIATION
OF AMERICA INCORPORATED
 INCORPORATED UNDER LAWS OF WISCONSIN




AMERICAN BREEDERS TO LEAD THE WORLD IN PURSUELY AND ELITE LINES

Certificate of Registration.

Name _____
 Sex _____
 Color _____
 Bred by _____ P.O. _____ State _____
 Trained _____
 Now owned by _____ P.O. _____ State _____

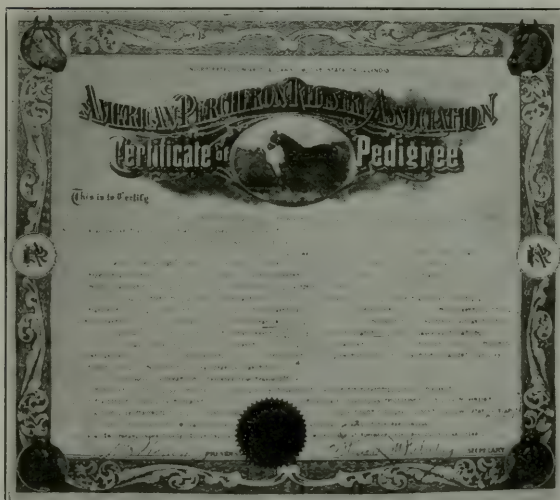
Has been duly recorded
 in the _____ of the International Coach and Draft
 Horse Association, given under our hands and
 seals this _____ day of _____ 19____ at La Crosse, Wisconsin.
 Secretary.



International Coach and Draft Horse Association
 of America.



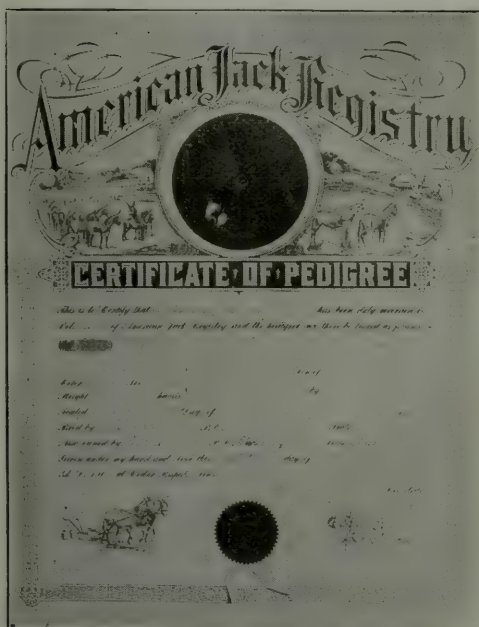
American Percheron Registry Association.



American Percheron Registry Association.



The American Percheron Horse Breeders Association. (Now owned by the Percheron Society of America.) Certificates numbered above 35912 issued by above association, null and void.



American Jack Registry.

LICENSED STALLIONS IN CALIFORNIA.

ALAMEDA COUNTY.

Purebreds.

License number	Name and address of owner	Name and breed of stallion
1275—	Corniff, James E., Livermore	Jean Bart 51747 Percheron
1192—	Dublin Horse Co., Hayward	Mayan 105297 Percheron
1171—	Goulart, H., Pleasanton	Enoch 23638 French Draft
1109—	Livermore Belgian Horse Co., Livermore	Jules Dezulta 4460 Belgian
1066—	Mohr, H. P., Pleasanton	Gomer 6757 Shire
1067—	Mohr, H. P., Pleasanton	Boro Ruler 11103 Shire
1238—	Silva, John F., Newark	Japonais 5969 Belgian
1133—	Summit Percheron Horse Co., Altamont	Karton 88593 Percheron
1272—	Livermore Per. Horse Ass'n., Livermore	Koloh 93418 Percheron
1278—	MacKenzie, R. J., Pleasanton	Vernon McKinney 53803 Standard

Nonstandard.

7—MacKenzie, R. J., Pleasanton	The Anvil	*****
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Grades.

353—Bond, Geo. W., Irvington	Little Giant	Percheron
315—De Kidos, Domingos, Alvarado	Charley	Belgian
2052—Luiz, Tony D., Niles	Doman	Belgian

Mongrels.

495—Mendoza, M., Mission San Jose	Bill	Mongrel
489—Rasmussen, Herman J., Hayward	Jerry	Mongrel
483—Soito, Joe S., Pleasanton	Jet	Mongrel

AMADOR COUNTY.

Purebreds.

1183—Elledge, U. F., Ritchey	Dave McKinney 38783	Standard
1086—Irelan, Bert, Jackson	Major 47923	Percheron

BUTTE COUNTY.

Purebreds.

1142—Darge, Albert, Chico	Xaintraille 50619	Percheron
1211—Franklin, J. A., Durham	Jaseur 87206	Percheron
788—Manes, R. M. & Williams, J. M., Oroville	Limousin 99169	Percheron
1316—Dunahoo, P. D. & Kearns, J. O., Biggs	Karabe 99003	Percheron

Grades.

337—Darge, Albert, Chico	Black Diamond	Shire
338—Simpson, G. H., Honcut	Bronze McKinney	Standard
374—Laney, Asa, Gridley	Freddie	French Coach
376—Turner, Angus, Chico	Prince	Percheron

Mongrels.

494—Milligan, A. W., Bangor	Dude	Mongrel
597—Gianella, Thos. A., Honcut	Barney	Mongrel

CALAVERAS COUNTY.

Purebreds.

1117—Borden, I. L., Jenny Lind	Pink Prince 84819	Percheron
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Grades.

312—Breeze, Wm., Jenny Lind	Alto Arabian	Standard
299—Kennedy, W. E., Burson	Duke	Percheron

Mongrels.

507—Borden, I. L., Jenny Lind	Duke	Mongrel
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COLUSA COUNTY.

Grades.

License number	Name and address of owner	Name and breed of stallion
342—	Aroedsen, Chas., College City	Mastic Junior Belgian
343—	Maham, F. M., Grimes	Nemo Belgian
381—	Blevins, C. W., Williams	Prince Tom Percheron

Purebreds.

1322—	Finks & Sutton, Maxwell	Jorian 76069 Percheron
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Mongrels.

599—	Hawk, F. S., Grimes	McAntara Mongrel
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CONTRA COSTA COUNTY.

Purebreds.

1237—	Antioch Percheron Horse Co., Antioch	Miroir 105295 Percheron
1169—	Avila, S. S., Concord	Harbora Combination 28357 Shire
1095—	Bishop Bros., San Ramon	Pedro of Paicines 23568 French Draft
1122—	Byron Belgian Horse Ass'n., Byron	Hazon II 90501 Percheron
1209—	Christensen, C. W., Danville	Ardent 5953 Belgian
997—	Contra Costa Co. Per. Horse Ass'n., Antioch	Mefiant 45970 Percheron
1243—	Easton, Ansel M., Diablo	Anwick Arthur 14730 Shire
1092—	Easton & Ward, Diablo	Salvador Conquerer 15944 Shire
1093—	Easton & Ward, Black Hawk Ranch, Diablo	Madcap 15960 Shire
1076—	Easton & Ward, Black Hawk Ranch, Diablo	Dovecote King 15957 Shire
1004—	Rademasher, B., Concord	Kirch 35222 Percheron
1013—	Thomas, S. C., Concord	El Jafil 74 Arabian

Crossbreds.

13—	Pereira, M. E., Martinez	Ban Crossbred
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EL DORADO COUNTY.

Purebreds.

1028—	Carlson, A., Camino	Sultan 70306 Percheron
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Grades.

390—	Dunlap, Elon, Diamond Springs	Diamond the First * * * *
371—	Thorne, D. W., Uno	Buster Brown Percheron & Clydesdale

FRESNO COUNTY.

Purebreds.

1276—	Hancock, H. M., Riverdale	Volumineux 16448 French Draft
1101—	Andrews, F. A., Riverdale	Calbrenca 2779 Belgian
1184—	Goodrich, C. F., Tranquillity	Clair De Lune 61965 Percheron
1135—	Griffin, J. W., Sanger	Windzuiper 6830 Belgian
998—	Martin, George W., Kerman	Sultan de Zee 1459 Belgian
1010—	Wildermuth Brothers, Selma	Roderic 40541 Percheron
2123—	Strahan, Columbus, Laton	Joe Beall 30315 French Draft
1058—	Woy, M. L., Fresno	Stanford McKinney 45173 Standard
1274—	Poytress, J. A., Oleander	Banquete 69177 Percheron
1261—	Simpson, Marvin, Academy	Majeur 105298 Percheron
1307—	Schrack, J. J., Selma	Woodrow 101374 Percheron
1266—	Neilsen, J. H., Selma	Expressive Mac 41523 Standard

Grades.

345—	Allen, T. E., Clovis	George Percheron
336—	Eversoll, Wm., Burroughs	Billy Taft Percheron
314—	Harnish, C. M., Laton	Black Ben Percheron
340—	Grant, G. W., Sanger	Prince Standard
356—	Long, Frank, Reedley	Mac Percheron
396—	Freeman, W., Reedley	Jack Percheron
391—	Thomas, T. O., Laton	Colonel French Draft
395—	Frisch, Peter, Fresno	Brigadier Percheron

Mongrels.

License number	Name and address of owner	Name and breed of stallion
537—	Bisi, August, Fresno	Roger Bon Temp. Mongrel
469—	Harnish, G. M., Laton	Balleau Mongrel
510—	Lazy H Ranch Co., Sanger	Wawa Mongrel
536—	Long, Frank, Reedley	Black Diamond Mongrel
490—	Oliver, Robt., Oleander	Dave Mongrel
517—	Sawal, Emil, Kerman	Capp Mongrel
600—	Garagidian, Sahag, Fresno	Belgium Mongrel
557—	Hancock, Ben, Piedra	Dan Mongrel

GLENN COUNTY.**Purebreds.**

1175—	Merrill, M. A., Willows	Chatelet 40559	Percheron
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Grades.

350—	Flood, J. T., Newville	Delmont	Standard
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Mongrels.

546—	Jones, William, Orland	Barney	Mongrel
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HUMBOLDT COUNTY.**Purebreds.**

1077—	Anderson, Jaspier, Hydenville	Janvier 41246	Percheron
1206—	Colegrove, Francis, Hoopa	Sir Poleon 52065	Standard
1080—	Linser, Ernest R., Garberville	Tobin 52496	Belgian
1061—	Markham, William A., Samoa	Humboldt Idumeen 133180	
1299—	McLaughlin, B., Eureka	Loris 99004	Percheron
1310—	Rohnerville Per. Horse Co., Rohnerville	Idumeen 90245	Percheron

Grades.

357—	Carroll, Matt, Arcata	Captain Tom	*****
347—	Jenks, E. A., Alderpoint	Prince	German Coach
301—	Taylor, R. H., Bridgeville	Buster Brown	Standard

Mongrels.

540—	Edeline, P. O., Waddington	Trojan	Mongrel
554—	Northern Redwood Lumber Co., Korbelt	Jeff	Mongrel
553—	Northern Redwood Lumber Co., Korbelt	Prince Albert	Mongrel

IMPERIAL COUNTY.**Purebreds.**

603—	Corfman, Joel, Heber	Barney	Mongrel
1014—	Mack, S. C., Imperial	Judge Taft 49825	Standard
1021—	Mercereau, R. D., Holtville	Ruprecht 3865	German Coach
1312—	Carter, Frank, El Centro	Noirhat Bengali 6815	Belgian

Mongrels.

2089—	Agiular, J. M., Calexico	John	Mongrel
524—	Forester, E. E., El Centro	San Sr.	Mongrel
463—	Schumacker, G. A., El Centro	Heinie Schreiner	Mongrel
591—	Moore, A. H., Imperial	Cylem	Mongrel
601—	Schooling, Joseph, Brawley	Major	Mongrel

INYO COUNTY.**Purebreds.**

2126—	Read, Geo. J., Bishop	Dock 119724	Percheron
1132—	Garner, G. W., Barras & Co., Bishop	Kab 87292	Percheron
1323—	Bell, Joseph G., Bishop	Havresac 44769	Percheron

KERN COUNTY.**Purebreds.**

License number	Name and address of owner	Name and breed of stallion
1102—Akers, O., Bakersfield	De Moivre 64754	Percheron
999—Hadlock, Ben & Davis, James, Bakersfield	Tom 6554	Belgian
1156—Little, N. W., Wasco	Hadebout 54215	Percheron
1231—Rio Bravo & Rosedale Horse Association, Bakersfield	Konsulat 93366	Percheron
1143—Taylor, H. L., McFarland	Halot 70372	Percheron
1103—Union Ave. Belgian Horse Co., Bakersfield	Corcoran B 5063	Belgian

Grades.

328—Azavedo, A. G., Bakersfield	Dick	Belgian
368—Michael, G. W., Bakersfield	Wilson	Belgian
393—Heard, H. L., McFarland	Diomedé Jr.	Percheron

Mongrels.

559—Ashe, R. S., Bakersfield	Chief	Mongrel
2090—Clausen, Fritz, Bakersfield	Prince	Mongrel
197—Wafford, Irwin L., Loraine	Ranger	Mongrel
588—Hathway, Howard, Bakersfield	Yellow Stone	Mongrel
561—Gibson, E. R., Bakersfield	Friday	Mongrel
2106—Grischott, Con, Bakersfield	Teddy	Mongrel
2107—Odett, Percy, Lebec	Pat	Mongrel

KINGS COUNTY.**Purebreds.**

1235—Goulart, F. S., Hanford	Braddy 68653	Percheron
1246—Lewellyn, Charles, Hanford	Lucumon 92888	Percheron
1294—Borges, E. R., Lemoore	Seigbert 18694	French Draft

Mongrels.

555—Cunningham, Jos., Corcoran	Highland Duke	Mongrel
503—Ingram, J. E., Lemoore	Grampas	Mongrel
580—Rognon, G. I., Corcoran	Petigru Jr.	Mongrel

LAKE COUNTY.**Purebreds.**

1087—Green, Stephen, Upper Lake	Pronto 106914	Percheron
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Grades.

382—Parker, Frank, Middletown	Major	Standard
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Mongrels.

521—Millsap, R. L., Lower Lake	Jack	Mongrel
2103—Pluth, Jack, Upper Lake	Prince L	Mongrel

LASSEN COUNTY.**Purebreds.**

1065—DeForest, Chas. V., Susanville	Carabinier 4979	Belgian
1063—McQueen, C. W., Doyle	Raven 22836	French Draft
1265—Hall, A. J., Doyle	Lord Marcus 15381	Clydesdale

LOS ANGELES COUNTY.**Purebreds.**

1249—Baldwin, Anita M., Santa Anita	Norito 55925	Thoroughbred
1250—Baldwin, Anita M., Santa Anita	Cibolo 134	Arabian
1251—Baldwin, Anita M., Santa Anita	Ibn Mahruss 22	Arabian

LOS ANGELES COUNTY—Continued.**Purebreds—Continued.**

License number	Name and address of owner	Name and breed of stallion
1252—Baldwin, Anita M., Santa Anita	Althazar 105500	Percheron
1253—Baldwin, Anita M., Santa Anita	Cruzados 22585	Thoroughbred
1254—Baldwin, Anita M., Santa Anita	Adalid 69635	Thoroughbred
1255—Baldwin, Anita M., Santa Anita	Jusque 79515	Percheron
1256—Baldwin, Anita M., Santa Anita	Rey El Santa Anita, Vol. VI P. 143	Thoroughbred
1144—English, Revel Lindsay, Pasadena	Highland Squirrel Kind 1881	American Saddle
1079—Huntington Beach Co., Huntington Beach	Kino 89668	Percheron
1085—Lowe, Thaddeus, Los Angeles	Pablo 6958	American Saddle
1068—Winter, Chas. W., Alhambra	Alhambra Prince 57367	Standard
2148—Carter, Jonathan, Downey	Don Direct 01294	Standard
2147—Carter, Jonathan, Downey	Neron 6376	Belgian
1295—Wallace, C. P., Compton	Kersaint 87203	Percheron

Crossbreds.

12—Sidwell, C. C., Huntington Park	Sonoma Pride Percheron and Nor.
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Grades.

344—Young Bros., Los Angeles	Major	Belgian
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Mongrels.

488—Rowland, W. R., Puente	Bert	Mongrel
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MADERA COUNTY.**Purebreds.**

1227—Karahadian, K., Madera	Liniment 101509	Percheron
1059—Tilton, A. H., Madera	Hell 91477	Percheron
1060—Tilton, A. H., Madera	Loussat 97578	Percheron
1284—McFadden, J. H., Chowchilla	Mako 106648	Percheron

MARIN COUNTY.**Purebreds.**

1062—Bolin's Breeders Association, Bolinas	Occo 4033	German Coach
1182—Bugeia Bros., Novato	Kenilworth 18655	Thoroughbred
1150—Pt. Reyes Horse Breeders Ass'n., Pt. Reyes Station	Perfection of Paicines 99322	Percheron

Grades.

352—Bugeia, L. M., Novato	Royal	Belgian
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MARIPOSA COUNTY.**Mongrels.**

496—Frisbie, R. F., Ben Hur	Jasmin Jr.	Mongrel
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MENDOCINO COUNTY.**Purebreds.**

1091—Briggs, M. C., Potter Valley	Jonas 92827	Percheron
1139—Davis, H. R., Ukiah	Chiron 100397	Percheron
1215—Howell, E. D. & Co., Ukiah	Anatol 2903	German Coach
1084—Manchester Per. Horse Co., Manchester	Modal 105296	Percheron

Grades.

320—Bevans, W. S., Potter Valley	Dandy	Shire
325—Finnist Colony, Calpella	Nick	Percheron
331—Gschwend, Mrs. Julia, Philo	Mallo II	Shire
339—Warner, Geo., Willets	Rameur Jr.	Percheron

Mongrels.

550—Howell, E. D., Ukiah	Tom Dailey	Mongrel
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MERCED COUNTY.**Purebreds.**

Licence number	Name and address of owner	Name and breed of stallion
1167—	Abbott, A. N., Merced.....	Lustridon 33192 .....Standard
1016—	DeSilva, Joe M., Los Banos.....	Star 105581Percheron

Grades.

319—	Newman, Paul, Le Grande.....	FredPercheron
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MODOC COUNTY.**Purebreds.**

1125—	Gould, John, Lookout.....	Modoc Chief 42759.....Percheron
1157—	Hess, E. M., Canby.....	Lad-For-Me 26512 .....Percheron
1078—	Newport, Jesse, Alturas.....	Jatinum 90758.....Percheron

MONTEREY COUNTY.**Purebreds.**

1268—	Almstead, A. G. & Wm. Casey, San Lucas.....	Ingrat 54098.....Percheron
1088—	Brinan, Thos., San Ardo.....	Irun 1908.....Percheron
1305—	Brown, Harlow C., San Ardo.....	Mt. Kaweah 15453.....Shire
1125—	Clegg, C. H. & J. F. Dinmore, Valleton.....	Favoris 1619.....Belgian
1051—	Hansen, L. M., Soledad.....	Bayard de Genly 4328.....Belgian
1003—	Johnson, H. N., Moss.....	Bayard 6733.....Belgian
1223—	King City Percheron Horse Co., King City.....	Humorisme 96668.....Percheron
1179—	McGrury, John, Salinas.....	Amoureux 5061.....Belgian
2132—	Reinhold, Arnold, Gonzales.....	Pattern 66554.....Percheron
1137—	Rohde, L. P., Salinas.....	Sorrento 70377.....Percheron
1056—	Work, T. A., Monterey.....	Nailstone Boxer II, 13643.....Shire
2146—	Hansen, Albert C., Salinas.....	Cerbere de Wil 5079.....Belgian Draft

Mongrels.

498—	Bashline, S. T., Salinas.....	Blondie .....Mongrel
509—	Greenlaw, John A., Parkfield.....	Scottish Chief .....Mongrel

NAPA COUNTY.**Purebreds.**

1015—	Bors, J. C., Oakville.....	Branhope Peel 28133.....Shire
1055—	Napa Draft Horse Co., Napa.....	Mouton 106144.....Percheron
1107—	Scally, M., Napa Junction.....	Boro' Rival 11590.....Shire
1303—	Schaeffer, H. C., Pope Valley.....	Tafta 23494.....French Draft
1100—	St. Helena Percheron Co., St. Helena.....	Machefer 107861.....Percheron

NEVADA COUNTY.**Purebreds.**

1311—	Nevada Co. Percheron Co., Nevada City.....	Sir George 53609.....Percheron
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ORANGE COUNTY.**Purebreds.**

1007—	Forster, F. A., Santa Ana.....	Swedish King 65587.....Thoroughbred
1041—	Orange Co. Draft Horse Co., Santa Ana.....	Fanforan II 65726.....Fanforan II
1123—	Stewart, Geo. W., Santa Ana.....	Sampson 73481.....Percheron
1321—	Thomas, F. M., Santa Ana.....	Queen's Paul 41275.....Percheron

Grades.

341—	Carillo, J. G., El Toro.....	Trabuca BoyGrade
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PLACER COUNTY.**Purebreds.**

1185—	Miller, Jacob J., Lincoln.....	Bennas 12898.....French Draft
1324—	Canow Bros. & Chas. Ferguson, Auburn.....	Joseph 99578.....Percheron

Grades.

License number	Name and address of owner	Name and breed of stallion
370—	Rogers, I. N., Lincoln	Black Diamond Percheron
369—	Rogers, I. N., Lincoln	Henry Ford Percheron
373—	Maas, A. C., Bowman	Gambretta Percheron

Mongrels.

481—	Blackwell & Hendrickson, Rocklin	Caesar Jr. Mongrel
584—	Mears, Edward T., Auburn	Kid Mongrel

PLUMAS COUNTY.**Purebreds.**

1186—	Laffranchini Bros., Chilcoot	Castor 46794 Belgian
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RIVERSIDE COUNTY.**Purebreds.**

1115—	Allen, A. L., Perris	Jumbo Jr. 22912 Purebred
1189—	Aguirre, J. A., San Jacinto	Keota Charley 35256 Percheron
2118—	Bruson, R. L. & L. K. Patchin, Corona	Cæsar d' Olsene 3924 Belgian
2120—	Garay, J., Corona	Maheru II 52059 Percheron
1173—	Hall, F. L., Perris	Barnot 89266 Percheron
1309—	Miller-Hight Co., Perris	Garnon 100831 Percheron
2145—	Baxter, M. A., Ethanac	Barton 137542 Percheron
1314—	Hemet Stock Farm, Hemet	Wilbur Lou 52595 Standard

Mongrels.

581—	Densmore, W. H., Hemet	King Mongrel
2110—	Strickland, J. R., Elsinore	Prince Mongrel

SACRAMENTO COUNTY.**Purebreds.**

1008—	Glaser, Karl, Sacramento	Peter Klyo Bell 62389 Standard
1037—	Hall, Ward, Sacramento	Joe Carey 41774 Thoroughbred
1163—	Himebauch, M. E., Walnut Grove	Lohengrin 97627 Percheron

Grades.

334—	Barmby, Wm. E., Walsh Station	Jean Bart, Jr. Percheron
298—	Dixon, Wm., Folsom	Bobby Percheron
364—	Harrison, H. P., Elk Grove	Mastic Jr. Belgian
375—	Riffe, G. C., Galt	Carlock, D. J. R. * * * *
359—	Hatch & Comstock, Elk Grove	Prince Percheron

Mongrels.

2095—	King, Harvey, Galt	Joe Percheron
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SAN BENITO COUNTY.**Purebreds.**

1297—	Garcia, Enos, Hollister	Locka Manners 13495 Shire
1146—	Hollister Belgium Horse Co., Hollister	Chaval de la Lys 7695 Belgian
1313—	Reinosa, R. F., Tres Pinos	Hellien 61961 Percheron

Grades.

309—	Blacklock, John, Hollister	Belgian Bill Belgian
304—	Indart, John, Tres Pinos	Black Rose II * * * *
367—	Perry, Manuel, Hollister	Percheron Percheron

Mongrels.

568—	Indart, J. M., Tres Pinos	Nevada * * * *
2093—	Larios, M. P., Hollister	Ruinart, Jr. * * * *

SAN BERNARDINO COUNTY.

Mongrels.

License number	Name and address of owner	Name and breed of stallion
520—	Burbank, N. C., Chino	General Kruger * * * *

SAN DIEGO COUNTY.

Purebreds.

1187—	Bradbury, W. N., Escondido	Gordon 72383 Percheron
1042—	Bushnell, Ralph, Mesa Grande	Hrineberry 721169 Thoroughbred
1210—	Stockton, Louis E., Ramona	Aissey (67292) Percheron

Mongrels.

482—	Helm, Theofulio, Warner Springs	Jim * * * *
467—	Hillkowita, S., San Diego	Prince * * * *
468—	Benton, G. W., Descanso	"K" * * * *
2109—	Mills, A. D., San Marcos	Don * * * *

SAN FRANCISCO COUNTY.

Purebreds.

1053—	Farnum, Adeline Russella, San Francisco	Marse Abe 50028 Thoroughbred
1054—	Farnum, Adeline Russella, San Francisco	Dilleara 57462 Standard

SAN JOAQUIN COUNTY.

Purebreds.

1152—	Cassidy, G. F. & Cassidy, P. B., Stockton	Governor G 69409 Percheron
1019—	Clark, R. L., Lodi	Moru 94920 Percheron
1071—	Curran, E., Tracy	Princier 111612 Percheron
1221—	Dill Bros., Clements	Black Boy 41376 Percheron
1134—	Forman, P. C., Manteca	Mutin 41293 Percheron
1006—	Groom, F. A., Stockton	Dexter Derby 5525 Standard
1247—	Horan, W. J., Stockton	Sippeo 120653 Percheron
1081—	Hughes, I. S., Ripon	Conseil 80169 Percheron
2119—	Learned, H. G., Stockton	Albert 105583 Percheron
1193—	Learned, H. G., Stockton	Bay Boy 109419 Percheron
1166—	Liesy, G. H., Ripon	Imbu 44784 Percheron
1244—	Linden Horse Co., Linden	California Rex 3435 Thoroughbred
1245—	Linden Horse Co., Linden	Ministre 106146 Percheron
1110—	Lone Tree Percheron Horse Co., Escalon	Lit 97565 Percheron
1195—	Manteca Percheron Association, Manteca	Margio 106634 Percheron
1035—	Mast, Geo., Ripon	Rameur 40785 Percheron
1025—	Megerle, L. J., Lockeford	Labourdette 41262 Percheron
1198—	Page, W. F., Stockton	Mobilier 106639 Percheron
1282—	Prater, Wm. L., Ellsworth	Search Light 75227 Percheron
1258—	Sayles, B. E., Linden	Hero 66636 Percheron
1208—	Wakefield, J. W., Acampo	Hola 54360 Percheron
1024—	Whitmeier, Simon, Lockeford	Gontran 55938 Percheron
1116—	Wildwood Horse Co., Ellsworth	Perseus of Paicines 92761 Percheron

Grades.

354—	Causey, Loren H., Stockton	Black Dick Percheron
355—	Causey, Mrs. M. R., Stockton	Prince Percheron
322—	Chinn, Walter, Manteca	Manteca Boy Standard
360—	Jackson, A. T., Stockton	Royal McKinney Standard
327—	Sigelkoff, Arthur A., Farmington	Chester French Draft
346—	Ohm, John, Vernalis	Black March Percheron
377—	Pope, John J., Lodi	Star * * * *

Mongrels.

511—	Garnero, Fred, Stockton	Dan
593—	Gatto, Louis, Lathrop	Bill
399—	Gaul, A., Stockton	Inimitable * * * *

SAN LUIS OBISPO COUNTY.

Purebreds.

License number	Name and address of owner	Name and breed of stallion
1082—	Andre, J. J., San Luis Obispo	Domino de Leernes 4454—Belgian
1127—	California Polytechnic School, San Luis Obispo	Lucien 53130 —Percheron
1128—	California Polytechnic School, San Luis Obispo	School Boy 117687—Percheron
1129—	California Polytechnic School, San Luis Obispo	Master 122755 —Percheron
1131—	California Polytechnic School, San Luis Obispo	Pont Nuff 142383—Percheron
1168—	California Polytechnic School, San Luis Obispo	Chief Guardsman 18756—Clydesdale
1083—	Campbell, S. T., Paso Robles	Pratt 80917 —Percheron
1201—	Colony Holding Corporation, Atascadero	Director 117686 —Percheron
1089—	Evans, W. H., Paso Robles	Jonesie Mac 50871—Standard
1023—	Kneppel, Wm. & Peter, Adelaida	Michel 5622 —Belgian
1242—	Reis, J. M. & Bells, E. J., Morro	Moka 40732 —Percheron

Grades.

326—	Claassen, G. J., Paso Robles	Prince —Percheron
321—	Madonna, Paul F., Cayucos	Kleberde Second —Belgian
330—	Mankins, Henry, San Luis Obispo	Duke —Shire
2053—	Mankins, P. L., Arroyo Grande	Tony —Shire

Mongrels.

2094—	Fernandez, Louis, San Luis Obispo	Prince —Mongrel
474—	Matney, J. R., Creston	Clyde —Mongrel

SANTA BARBARA COUNTY.

Purebreds.

1030—	Bishop, T. B. Co., Goleta	Royal Irwin 16156—Clydesdale
1031—	Bishop, T. B. Co., Goleta	Rockwood 11078 —Clydesdale
1033—	Pearson, C. H., Los Alamos	Valseur 45176 —Percheron
1241—	Vear, Frank, Santa Maria	Hamster 70239 —Percheron

Grades.

324—	Carranza, Felis, Sisquoc	King Charm, Jr.—Clydesdale
362—	Craft, J. G., Lompoc	Prince —Percheron
389—	Elvidge, Joseph, Santa Maria	Lods, Jr. —Percheron
317—	Wineman, Erhart, Santa Maria	King —Shire

SANTA CLARA COUNTY.

Purebreds.

1293—	Coyote Percheron Horse Ass'n., San Jose	Bayard 91894 —Percheron
1177—	Hall, L. A., San Jose	Pink Paris 69415—Percheron
1000—	Palo Alto Per. Farm, Stanford University	Ibidem 44767 —Percheron
1001—	Palo Alto Per. Farm, Stanford University	Albert 107996 —Percheron
1229—	Skeels, Harry, Gilroy	Balsa Bill 123931—Standard
1296—	Uheman, Geo. A., San Jose	Implexe 69563 —Percheron

Grades.

310—	Borge, John M., Milpitas	Bill —Belgian
385—	Price, W. N., San Jose	Bob —Belgian
311—	Roose, O. E., Gilroy	David —Percheron
329—	Silva & Garcia, San Jose	Bill —Percheron
397—	Blanchard, J. E., San Jose	Diavalo —Standard

Mongrels.

558—	Oliver, W. M., Milpitas	Ned —Mongrel
505—	Stockton, C. A., San Jose	Black Ranger —Mongrel

SANTA CRUZ COUNTY.**Purebreds.**

License number	Name and address of owner	Name and breed of stallion
1219—	Silliman, G. F., Watsonville.....	Premier of Paicines 23567..... French Draft

SHASTA COUNTY.**Purebreds.**

1097—	Mills, Andrew, Anderson.....	Tryconnel 37909 ---Thoroughbred
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Mongrels.

479—	Smith, Mrs. L. C., Millville.....	Rock -----Mongrel
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SIERRA COUNTY.**Grades.**

392—	Star Ranch Co., Sattley.....	Smoke -----Belgian
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SISKIYOU COUNTY.**Purebreds.**

1191—	Calloway, H. F., Etna Mills.....	Superior Medium 46957 Standard
1300—	Clemmens, J. R., Dorris.....	Bruno de Promellas 4184 Belgian
1039—	Eller, Jesner, & Wagners Bros., Etna Mills.....	Forban 5085 -----Belgian
1049—	Fay, Walter, Etna Mills.....	Marcus 126256 -----Percheron
1046—	Lautner, Joseph, Dorris.....	Ketillac 88602 -----Percheron
1052—	McCloud River Lumber Co., McCloud.....	Hispanique 44358 -----Percheron
1047—	Mitchell, H. W., Mount Dome.....	Konsensus 88590 -----Percheron
1044—	Walker & Barnum, Etna Mills.....	Gerfaut de Zweve 3293 Belgian
1320—	Liskey, Chas., Hornbrook.....	Guisot 51764 -----Percheron
1319—	Scott Valley Shire Horse Breeders Ass'n., Etna Mills	Buscot Steven 14269 -----Shire

Grades.

307—	Hearn, Mrs. N. W., Hornbrook.....	Pete -----Percheron
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Mongrels.

515—	Young, R. J., Macdoel.....	Chief -----Mongrel
531—	Wadsworth, Robert, Macdoel.....	Don Americus -----Mongrel

SOLANO COUNTY.**Purebreds.**

1040—	Anderson, Neal, Rio Vista.....	Bors Wedger II 32010 -----Shire
1032—	Booher, Fay, Suisun.....	Don Ricadito Tecolote 54766.. Percheron
1034—	Chandler, F. B. Co., Vacaville.....	Atherton 22973 ---French Draft
996—	Ferguson, Wm. M., Dixon.....	Healani 56150 -----Standard
1094—	Kirby, James, Rio Vista.....	Hardy 5968 -----Belgian
1279—	Leveroni, T. J., Benicia.....	Dray Prince II 12957 -----Shire
1273—	Westgate, E. W., Rio Vista.....	Stow Royalty 15396 -----Shire

Mongrels.

499—	Hackman, Herman, Dixon.....	Pongo -----Mongrel
466—	Robben, F. W., Dixon.....	Blackwood -----Mongrel
457—	Schielke, H. H. C., Vacaville.....	Dandy Junior -----Mongrel

SOMONA COUNTY.**Purebreds.**

1207—	Cazadero Per. Horse Co., Cazadero.....	Missipi 107858 -----Percheron
1038—	Fitzpatrick, John, Bodega.....	Malseant 106136 -----Percheron
1281—	Hinshaw, W. P., Bloomfield.....	Eugene 68604 -----Percheron
2129—	Jack London Ranch, Glen Ellen.....	Sonoma Hillside 16842 -----Shire
2128—	Jack London Ranch, Glen Ellen.....	Mountain Lad 15932 -----Shire
1149—	Roberts, W. T., Penngrove.....	Laos 106129 -----Percheron
1106—	Serck, Peter O., Kenwood.....	Clayton 58683 -----Percheron

Grades.

License number	Name and address of owner	Name and breed of stallion
316—	Eckart, Ed., Cazadero.....	Bon Coeur, Jr.....Percheron
302—	McDonald, Alex., Valley Ford.....	Garibaldi.....Shire
300—	Pellascio, Walter, Valley Ford.....	Billy.....Shire
313—	Von Arx, Victor E., Cazadero.....	Teddy N.....Percheron
398—	Pedroncelli, Frank, Kenwood.....	George.....Belgian

Crossbreds.

14—	Cook, Fred B., Santa Rosa.....	Donald Cadet.....Shire
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Mongrels.

2101—	Baber, R. B., Santa Rosa.....	David Harun.....Mongrel
583—	Nufer, T. A., Petaluma.....	Pollock.....Mongrel
477—	Von Grafen, Roy, Santa Rosa.....	Prince.....Mongrel

STANISLAUS COUNTY.**Purebreds.**

1236—	Fairview Draft Horse Co., Turlock.....	Impromptu 77308.....Percheron
1118—	Fernandes Belgian Horse Co., Turlock.....	Cesar d' Hubaume 5954.....Belgian
2121—	Klehn, W. H., & I. C. Hansen, Newman.....	Fernando 134484.....Percheron
2131—	Olds, W. W., Denair.....	General Metz 127272.....Percheron
1204—	O'Leary, P. J., Modesto.....	Leake Prince II 6649.....Shire
1022—	Proctor, J. W., Hughson.....	Lentulus 99002.....Percheron
1203—	Whitmore, Guy C., Ceres.....	Keota Omer 35246.....Percheron

Grades.

372—	Stearns, J. B., Oakdale.....	Comet.....Percheron
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Mongrels.

513—	Morgan, Antony, Ceres.....	Tom.....Mongrel
577—	Parker, John, Modesto.....	Buffalo Dick.....Mongrel
541—	Ramazzina, I., Patterson.....	Bill.....Mongrel
539—	Woods, Frank, Newman.....	Van.....Mongrel
595—	Gish, W. M., Denair.....	Dolly's Charlie Boy.....Mongrel
596—	Nunes, J. B., Newman.....	Tom.....Mongrel

SUTTER COUNTY.**Purebreds.**

1263—	Carpenter, J. C., Yuba City.....	Figaro de Maeter 5083.....Belgian
1216—	West Butte Horse Co., Meridian.....	Makis 104140.....Percheron

Grades.

305—	Coffman, C. W. & Daniel Coffman, Meridian.....	Broadaxe.....French Draft
303—	Michels, F. J., Nicolaus.....	Prince.....Percheron
379—	King, Jos. F., Sutter City.....	Andacieux, Jr.....French Draft

TEHAMA COUNTY.**Purebreds.**

527—	Boots, J. T., Red Bluff.....	George.....Mongrel
1217—	Clark, A. R., Corning.....	Groom 41264.....Percheron
1036—	Stone, W. H., Manton.....	Richard de Bierset 10318.....Belgian

TRINITY COUNTY.**Grades.**

333—	Hotchkiss, R. G. & S. Mauser, Hoaglin.....	Burbank.....Standard
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TULARE COUNTY.

Purebreds.

License number	Name and address of owner	Name and breed of stallion
1158—	Adams, John J., Dinuba	Louis de Belle Croix 6610 Belgian
1069—	Gilmer, T. L., Thompson, W. M., & Ryan, J. J., Tipton	Majeste 5932 Belgian
1018—	Gist, T. J. & Sons, Tulare	Bruno 101413 Percheron
1197—	Green, J. W., Waukena	Bay King 41895 Percheron
2133—	Merritt-Bowers Co., Tulare	Brussell 9259 Belgian
2134—	Merritt-Bowers Co., Tulare	Stevenot 9260 Belgian Draft
2135—	Merritt-Bowers Co., Tulare	Dewey 11158 Belgian Draft
2136—	Merritt-Bowers Co., Tulare	Raven 5945 German Coach
2137—	Merritt-Bowers Co., Tulare	General Sherman 18042 Shire
2138—	Merritt-Bowers Co., Tulare	Woodland 141084 Percheron
1286—	Merritt-Bowers Co., Tulare	Cadet of Paicines 9241 Belgian
1288—	Merritt-Bowers Co., Tulare	Patre of Paicines 111450 Percheron
1290—	Merritt-Bowers Co., Tulare	Adonis 9717 Belgian
1292—	Merritt-Bowers Co., Tulare	Inquiet 69564 Percheron
2140—	Merritt-Bowers Co., Tulare	Herbert 31293 French Draft
2141—	Merritt-Bowers Co., Tulare	Varcoe 44066 Standard
1306—	Skeen, T. D., Angiola	Hainvilliers 70242 Percheron
1029—	Smith, Harold, Tulare	Silesto 4405 German Coach
2144—	Warren, J. E., Tulare	Prince Searchlight 18043 Shire
1075—	Williams, Park, Dinuba	Germain 41239 Percheron

Grades.

308—	Glover, G. N., Alpaugh	Bill Belgian
361—	Wood, J. L., Visalia	Doc Percheron

Mongrels.

522—	Bruce, Dan, Tulare	Colonel Mongrel
518—	Chambers, L. P., Alpaugh	Kid Madison Mongrel
543—	Davis, Chas. M., Waukena	Tom Mongrel
500—	Dresser Bros., Tulare	Stonewall Mongrel
455—	Mosier, J. C., Visalia	Ras Mongrel
549—	Woods, J. L., Visalia	Jim Mongrel
548—	Woods, J. L., Visalia	Chieftain Mongrel

TUOLUMNE COUNTY.

Purebreds.

1043—	Childress, O. D., Sonora	Belmont 116157 Percheron
1202—	Zimdars, Waldemar, Columbia	Bouton 42600 Percheron

Mongrels.

473—	Childress, O. D., Sonora	Little Sid Mongrel
533—	Jones, James C., Soulsbyville	Rowdy Mongrel
506—	Sharrock, Geo. A., Sonora	Norman Doc Mongrel

VENTURA COUNTY.

Purebreds.

1124—	Harris, Frank, Montalvo	George 60034 Percheron
1270—	Kennedy, M. A., Moorpark	Duke 89544 Percheron
2130—	D. McGrath Estate Co., Oxnard	Roland 123177 Percheron
1045—	Wm. J. McMillan, Santa Paula	Brillant 30174 Percheron

Mongrels.

480—	Dunn, J. F., Piru	Duke Mongrel
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YOLO COUNTY.

Purebreds.

1164—	Kermich Bros. & J. D. Rowe, Davis	Havanais 44383 Percheron
1048—	University of California, Davis	Aiglone 121004 Percheron
1218—	Madison Belgian Horse Co., Madison	Gladiateur 5562 Belgian
1050—	Montgomery, J. E., Davis	Jim Logan 44997 Standard

Grades.

License number	Name and address of owner	Name and breed of stallion
387—James, J. E., Esparto	Bobn'r	Belgian
366—Olsen, C., Woodland	Daniel the Great	Percheron
365—Olsen, C., Woodland	Herald Haarfrage	Percheron

YUBA COUNTY.

Purebreds.

1162—Gallagher, A., Wheatland	Acteur 65108	Percheron
1172—Sanders, J. H., Smartsville	The Senator 43288	Thoroughbred
1073—Zbinden, G., Browns Valley	Kabotin 97570	Percheron

Grades.

349—McCune, P. W., Marysville	M. D. M.	Standard
348—Saunders, J. H., Smartsville	Sidney Wilkes	Standard

LICENSED JACKS IN CALIFORNIA.

BUTTE COUNTY.

Purebreds.

License number	Name and address of owner	Name and breed of stallion
1096	Elkins and Milligan, Honcut	Frank McClintock
1098	R. M. Manes and J. M. Williams, Oroville	Monarch Jr. 2096

Mongrels.

567	Angus Turner, Chico	Nero
598	Gianella Land Co., Nord	Yuba Boy

CALAVERAS COUNTY.

Purebreds.

1165	C. W. Tryon, Angels Camp	Burt 20293
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Mongrels.

462	Luke Botto, Vallecito	Jim
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COLUSA COUNTY.

Purebreds.

1277	C. W. Blevins, Williams	"Junbo, Jr."
1161	F. M. Maham, Grimes	Klondyke 7754

Grades.

384	L. Cecil, Grimes	Brigham Young
383	L. Cecil, Grimes	Grey Eagle
323	Geo. Poe, Williams	Jauneau

Mongrels.

519	Chas. A. Arvedsen, College City	Clondyke
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CONTRA COSTA COUNTY.

Purebreds.

1057	Brentwood Jack Association, Brentwood	Kentucky Wonder 2603
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FRESNO COUNTY.

Purebreds.

2149	Jerry Chamberlain, Laton	Cyclone "E"
1136	Wm. Eversoll, Burrough	Christine's Joe Shelby 4145
1230	S. D. Harmon, 2070 Tyler Ave., Fresno	Stonewall Jackson 7898
1222	J. E. Hawthorn, R. R. "F" Box 313, Fresno	Reno Jr. 11918
1196	J. R. Hawthorn, R. R. "F," Box 339B, Fresno	Jumbo 20355
1104	Setchel Fruit Co., Box 1347, Fresno	Gov. Beecher 7954

Grades.

318	M. L. Woy, 203 Edgerly Bldg., Fresno	Commodore Perry
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Mongrels.

564	A. G. Mittlestead, Burrel, Fresno Co.	Poncho the Great
569	J. H. Nelson, Selma	Kentucky Jumbo
556	G. W. Pfost & Son, Laton	Denmark
562	Marvin Simpson, Academy	Stamboul
2099	Shannon Est. by S. A. Shannon, Burrel	Ponchito
491	B. Didonato, Clovis	K. George
512	Ray S. Gavette, Laton	Sunny Jim
458	Wildermuth Bros., Selma	Stonewall Jackson

GLENN COUNTY.**Purebreds.**

License number	Name and address of owner	Name and breed of stallion
1181—	J. T. Flood, Newville	Jess Crouch 5515
1180—	J. T. Flood, Newville	Brigham Jr. 20278
1174—	Morris A. Merrill, Willows	Joe 21097

Mongrels.

589—H. B. St. Louis, Norman-----Tom

HUMBOLDT COUNTY.**Mongrels.**

492—Ernest R. Linser, Gerberville-----Pete

IMPERIAL COUNTY.**Purebreds.**

2124—	C. W. Brockman, Calexico	Stonewall II 20493
2125—	Frank Carter, El Centro	Black Boy 6617
1020—	L. O. Crummer, Brawley	Jumbo 11570

Mongrels.

2105—	L. C. Byran, R. F. D. 1, Box 209, Brawley	Mitchell
487—	James A. Ray, Holtville	Don
523—	E. E. Forrester, El Centro	Governor
532—	W. S. Moore, El Centro	Ben

INYO COUNTY.**Purebreds.**

1215—H. R. Van Velsir, Mammoth (Round Valley)-----Steve Gray 12810

KERN COUNTY.**Purebreds.**

1160—	Vineland Stock Co., Bakersfield	Burk 2100
1111—	Chris Ruedy, Bakersfield	D. T. Mattlock 9386
1108—	Gibson Jack Co., Wasco	Round Trip 5599
1214—	Vineland Stock Co., R. F. D. 4, Bakersfield	Joe Tribble 5606
2142—	J. A. Bone, Bakersfield	"McIlroy's Pride" 2103

Mongrels.

493—	Luceano Castro, Bakersfield	Ends
560—	R. S. Ashe, Bakersfield	The Boy

KINGS COUNTY.**Purebreds.**

1233—	F. S. Goulart, R. F. D. "C," Box 195A, Hanford	Champ Clark 20056
1283—	G. L. Rognon, Corcoran	Rube Roy Riley 50907
1147—	E. W. Sargent, R. F. D. "C," Hanford	Seal 2335

Mongrels.

585—J. M. Reed & Bros., Lemoore-----Rousean

LOS ANGELES COUNTY.**Purebreds.**

1090—	W. R. Rowland, Puente	Knox 9189
1257—	Anita Baldwin, Santa Anita	King Bersheba 5585
2122—	John M. Baum, et al., Inglewood	"Rickle Dale Duke" 22950
1120—	William Brill, 620 S. Grand Ave., L. A.	Native Son 20566

MADERA COUNTY.**Purebreds.**

License number	Name and address of owner	Name and breed of stallion
1005—	J. B. McDonald, O'Neals	Ben Hur 5664
1141—	C. F. Smith, Madera	Duke 2390
1225—	K. Karahadian, Rt. "A," Box 126 Madera	Joe Junior 12101

Mongrels.

2102—	A. S. Van Curren, P. O. Box 133, Madera	"Kentucky Boy"
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MARIPOSA COUNTY.**Purebreds.**

2127—	L. L. Hart, Mariposa	Black Republican 2613
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MENDOCINO COUNTY.**Mongrels.**

566—	J. R. Hill and C. H. Johnson, Covelo	Panama
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MERCED COUNTY.**Mongrels.**

508—	G. W. Baxter, Legrande	April Fool
2100—	Legrande Jack Ass'n., Jas. A. Kahl, Sec., Merced	Solomon

MONTEREY COUNTY.**Purebreds.**

1267—	Wm. Casey and Wm. Blair, San Lucas	President Taft 5121
1304—	J. C. Edwards, Lockwood	Jim McCord 9023

NAPA COUNTY.**Mongrels.**

587—	H. C. Schaeffer, Pope Valley	Boyd
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ORANGE COUNTY.**Purebreds.**

2143—	B. P. Clinard, El Toro	"Captain Woods" 22003
1064—	J. C. Joplin, Santa Ana	Bradley's Nero 7901
1012—	O. Rosenbaum, San Juan Capistrano	Big Jeff 20354

Mongrels.

529—	The Irvine Co., Tustin	Bryan
528—	The Irvine Co., Tustin	Wilson

PLACER COUNTY.**Mongrels.**

484—	P. C. Anderson, Box 45, Roseville	Sampson
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RIVERSIDE COUNTY.**Purebreds.**

1112—	A. L. Allen, Perris	Starlight Junior 11797
1113—	A. L. Allen, Perris	Buster 14621
1114—	A. L. Allen, Perris	Black Jumbo 5570
1153—	L. V. W. Brown, Riverside	Dock 13206
1154—	L. V. W. Brown, Riverside	Givens Pride 12623
1190—	W. F. Keil, San Jacinto	Raggo Fred 3066

Mongrels.

486—	M. L. Mapes, Perris	Monarch
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SACRAMENTO COUNTY.**Purebreds.**

License number	Name and address of owner	Name and breed of stallion
1121—	Fred Kingsberry, R. F. D. 2, Box 645, Sacramento.....	Mack Giant 20995

Mongrels.

2104—	Harvey C. King, Herald.....	"King Pin"
575—	Harvey C. King, Herald.....	Blue Dick

SAN BERNARDINO COUNTY.**Purebreds.**

1145—	Revel L. English, Chino.....	Fecundo 203
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SAN DIEGO COUNTY.**Purebreds.**

1325—	Hutching, A. H., San Diego.....	Matlocks Duca 2nd 4397
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Mongrels.

471—	S. S. Kelso, Cardiff-by-the-Sea.....	Big Jerry
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SAN JOAQUIN COUNTY.**Purebreds.**

1259—	Sayles Bros., R. F. D. 1, Linden.....	Black Percy 3885
1220—	Dill Bros., Clements.....	Stylish John 12210

Mongrels.

461—	L. Leonardini, Linden.....	Mono
502—	Harvey Beckwith, Bethany.....	Little Jumbo
2092—	L. Harris, R. F. D. "A," Escalon.....	Johnny
552—	C. Kelley, Lodi.....	Taft
456—	Sutcliff & Allenbaugh, Manteca.....	Monty
579—	Peter Moy, Stockton.....	Big Tom

SAN LUIS OBISPO COUNTY.**Purebreds.**

1070—	M. S. Stevenson, San Miguel.....	Tom 22570
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Grades.

363—	Charley Albright, Paso Robles.....	Bobby
351—	Thomas F. Freeman, Paso Robles.....	"Simon Pure"

SANTA CLARA COUNTY.**Mongrels.**

2091—	Jos. Hansen, Milpitas.....	Frank Helms
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SHASTA COUNTY.**Mongrels.**

516—	H. P. Beidman, Cottonwood.....	Joe Genilla
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SISKIYOU COUNTY.**Mongrels.**

475—	Walter Hovendon, Etna Mills.....	Accey
476—	H. W. Mitchell, Mt. Dome.....	Dewey
2108—	Walter Cross, Dorris.....	"K Jack"

SOLANO COUNTY.

Purebreds.

License number	Name and address of owner	Name and breed of stallion
1002—	C. J. Fink, Rio Vista	Stonewall Jackson Jr. 2615
1027—	F. W. Robben, Dixon	Dixon's Pride 9441
1026—	F. W. Robben, Dixon	Dairy City 9442
2151—	F. W. Robben, Dixon	"King Dixon" 15270

Mongrels.

538—	Walter Blacklock, Suisun	Teddy R.
514—	Charles Peters, Vacaville	Solano
464—	H. G. Winchell, Elmira	"Jack"

STANISLAUS COUNTY.

Mongrels.

454—	S. J. Boone, Newman	Ingo
576—	A. G. Chatton, Turlock	Coley
2097—	H. T. Crow, Modesto	Panama
2098—	H. T. Crow, Modesto	H. Kewah
2096—	H. P. Fentem, Newman	Blue Jay
465—	P. C. Kyne, Patterson	Dick
572—	Claude Osuna, Newman	Brownie
526—	W. H. Klehn & I. C. Hansen, Newman	Joe
573—	Claude Osuna, Newman	Elkhorn
574—	Claude Osuna, Newman	Bluebird

SUTTER COUNTY.

Purebreds.

1199—	P. A. Darrach, Pleasant Grove	Orphan Boy 2102
1264—	J. C. Carpenter, Yuba City	Pat Crow 2607

Grades.

380—	J. F. King, Sutter City	Black Hawk
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Mongrels.

571—	J. F. King, Sutter	Jumbo
460—	F. J. Michel, Nicolaus	Bismark

TEHAMA COUNTY.

Mongrels.

586—	Henry Clark, Corning	Nip
547—	A. H. Brockman, Los Molinos	Peter
570—	J. M. Goodrun, Red Bluff	Snip

TULARE COUNTY.

Purebreds.

1159—	John J. Adams, Dinuba	Diamond Dick 2897
1148—	C. K. Avery, Farmersville	Kentucky's Inca 5584
1170—	E. C. Cornell, Tipton	California Monarch 6590
1302—	W. L. Martin, Route A, Visalia	Rusaw 5043
2139—	Merriitt-Bowers Co., Tulare	"Sacramento" 23394
1017—	Walter A. Parr, Tulare	King Pin of Laton
1271—	Victor R. Sharp, Box 424, Visalia	Felix 13167
1260—	Walter Springer, R. F. D. "C," Box 21, Tulare	"Big Ben" 13828

Grades.

378—	L. Whitten, Visalia	Jumbo
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Mongrels.

582—	A. G. Hickman, Orosi	Sampson
578—	Arthur Kanawyer, Traver	Jasper
2111—	J. M. Thompson, Box 46, Angiola	Peacock
545—	J. M. Thompson, Angiola	Mocking Bird
472—	Park Williams, Box 76, Dinuba	Martin

VENTURA COUNTY.

Mongrels.

License number	Name and address of owner	Name of jack
470—E. W. Boone, Somis.....		"Jack"
535—E. W. Coates, Santa Paula.....		Taylor's Duke

YOLO COUNTY.

Purebreds.

1240—Frank Campbell, Box 246, Davis.....	Compound Alexander 3298
1239—Frank Campbell, Box 246, Davis.....	Moss 4075

Mongrels.

551—Fred E. Reusch, Zamora.....	Tom L. Smith
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YUBA COUNTY.

Purebreds.

1280—Armstead Bros. et al, Wheatland.....	Gen. Leo Jr. 2606
1269—George W. Curry, Marysville.....	Madera Chief 20098

Mongrels.

478—Mrs. Mary Breeden, 1018 G. St., Marysville.....	Sam
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APPENDICES.

APPENDIX A.

Summary of the Number of Stallions and Jacks by Counties.

Counties	Purebred	Grade	Crossbred	Nonstandard	Mongrel	Total	Jacks			Total
							Purebred	Grade	Mongrel	
Alameda	10	3		1	3	17				
Alpine										
Amador	2					2				
Butte	4	4			2	10	2		2	4
Calaveras	1	2			2	5	1		1	2
Colusa		4			1	5		3	1	6
Contra Costa	12		1			13	1			1
Del Norte										
El Dorado	1	2				3				
Fresno	12	8			8	28	6	1	8	15
Glenn	1	1			1	3	3		1	4
Humboldt	6	3		3	3	12			1	1
Imperial	3				5	8	3		4	7
Inyo	3					3	1			1
Kern	6	3			7	16	5		2	7
Kings	3				3	6	3		1	4
Lake	1	1			2	4				
Lassen	3					3				
Los Angeles	15	1	1		1	18	4			4
Madera	4					4	3		1	4
Marin	3	1				4				
Mariposa					1	1	1			1
Mendocino	4	4			1	9			1	1
Merced	2	1				3			2	2
Modoc	3					3				
Mono										
Monterey	12				2	14	2			2
Napa	5					5			1	1
Nevada	1					1				
Orange	4	1			5	5	3		2	5
Placer	2	3			2	7			1	1
Plumas	1					1				
Riverside	7				2	9	6		1	7
Sacramento	3	5		1	9	9	1		2	3
San Benito	3	3			2	8				
San Bernardino					1	1	1			1
San Diego	3				4	7	1		1	2
San Francisco	2					2				
San Joaquin	22	7		3	3	32	2		6	8
San Luis Obispo	11	4			2	17	1	2		3
San Mateo										
Santa Barbara	4	4				8				
Santa Clara	6	5			2	13				
Santa Cruz	1					1				
Shasta	1				1	2			1	1
Sierra	1					1				
Siskiyou	10	1			2	13			3	3
Solano	7				3	10	4		3	7
Sonoma	7	5	1		3	16				
Stanislaus	7	1			6	14			10	10
Sutter	2	3				5	2	1	2	5
Tehama	2	1				3			3	3
Trinity										
Tulare	20	2			7	29	8	1	5	14
Tuolumne	2				3	5				
Ventura	4				1	5			2	2
Yolo	4	3				7	2		1	3
Yuba	3	2				5	2		1	3
Totals	256	88	3	1	87	435	70	8	70	148

APPENDIX B.

Classified Summary of Purebred Stallions by Breeds.

Counties	Belgian	Clydesdale	French Coach	French Draft	German Coach	Hackney	Percheron	American Saddle	Shire	Standard	Arabian	Thorough- bred	Unclassified	Total
Alameda	2			1			4		2	1				10
Alpine														
Amador							1			1				2
Butte							4							4
Calaveras							1							1
Colusa														
Contra Costa	1			1			4		5		1			12
Del Norte														
El Dorado							1							1
Fresno	3			2			5			2				12
Glenn							1							1
Humboldt	1						4			1				6
Imperial	1				1					1				3
Inyo							3							3
Kern	2						4							6
Kings				1			2							3
Lake							1							1
Lassen	1	1		1										3
Los Angeles	1						4	2		2	2	4		15
Madera							4							4
Marin					1		1					1		3
Mariposa														
Mendocino					1		3							4
Merced							1			1				2
Modoc							3							3
Mono														
Monterey	5						5		2					12
Napa				1			2		2					5
Nevada							1			1				1
Orange							2					2		4
Placer				1			1							2
Plumas	1													1
Riverside	1						5			1				7
Sacramento							1			1		1		3
San Benito	1						1		1					3
San Bernardino														
San Diego							2					1		3
San Francisco										1		1		2
San Joaquin							20			1		1		22
San Luis Obispo	2	1					7			1				11
San Mateo														
Santa Barbara		2					2							4
Santa Clara							5			1				6
Santa Cruz				1										1
Shasta												1		1
Sierra	1													1
Siskiyou	3						5		1	1				10
Solano	1			1			1		3	1				7
Sonoma							5			2				7
Stanislaus	1						5		1					7
Sutter	1						1							2
Tehama	1						1							2
Trinity														
Tulare	7			1	2		7		2	1				20
Tuolumne							2							2
Ventura							4							4
Yolo	1						2			1				4
Yuba							2					1		3
Totals	38	4		11	5		140	2	19	21	3	13		256

APPENDIX C.

Classified Summary of Grade Stallions by Breeds.

Counties	Belgian	Clydesdale	French Coach	French Draft	German Coach	Hackney	Percheron	American Saddle	Shire	Standard	Norman	Thorough- bred	Unclassified	Total
Alameda	2						1							3
Alpine														
Amador														
Butte			1				1		1	1				4
Calaveras							1			1				2
Colusa	2						2							4
Contra Costa														
Del Norte														
El Dorado		1											1	2
Fresno				1			6			1				8
Glenn										1			1	1
Humboldt					1					1			1	3
Imperial														
Inyo														
Kern	2						1							3
Kings														
Lake										1				1
Lassen														
Los Angeles	1													1
Madera														
Marin					1		1					1		3
Mariposa														
Mendocino							2		2					4
Merced							1							1
Modoc														
Mono														
Monterey														
Napa														
Nevada														
Orange													1	1
Placer							3							3
Plumas														
Riverside														
Sacramento	1						3						1	5
San Benito	1						1						1	3
San Bernardino														
San Diego														
San Francisco														
San Joaquin				1			3			2				6
San Luis Obispo	1						1		2					4
San Mateo														
Santa Barbara		1					2		1					4
Santa Clara	2						2		1					5
Santa Cruz														
Shasta														
Sierra	1													1
Siskiyou							1							1
Solano														
Sonoma	1						2		2					5
Stanislaus							1							1
Sutter				2			1							3
Tehama														
Trinity														
Tulare	1						1							2
Tuolumne														
Ventura														
Yolo	1						2							3
Yuba										2				2
Totals	16	2	1	4	2		39		9	10		1	5	89

APPENDIX D.

At the session of 1916-1917 of the legislature the bill entitled, "An act to regulate the public service of stallions and jacks in the State of California," was amended in sections 1, 2, 3, 4, 6, 7, 8 and 9, and added a new section, which is numbered 11½. These amended sections change the law in a number of places and should be carefully read.

In section 1 of the old law the last sentence is struck out. It is not necessary now to have the license recorded with the county recorder. This will save you the cost of recorder's fee.

In section 2 the words, "and tags," have been added after the words, "stallion or jack license certificates." This means that when a certificate is issued there will also be a metal tag issued bearing the certificate number and designating whether it is purebred, grade, crossbred, non-standard or mongrel.

In section 3 provision is made for the veterinarian to specify on the affidavit if the stallion or jack is affected with any communicable disease or with any of the diseases or unsoundnesses mentioned in section 4 of this act.

In section 4 certain diseases or affections have been added in the amendment and a part of those given in the old law have been dropped.

Section 5 has not been changed.

Section 6 makes provision for the metal tag above mentioned to be placed upon the harness or bridle at all times during the breeding season.

In section 7 of the old law the studbooks used were the ones recognized by the United States Department of Agriculture, Washington, D. C. This is changed to read "Studbook recognized by said stallion registration board." This wording also appears in the certificates.

In section 8 the fees for new registrations, transfers and copies have been changed. New certificates are now \$2.75, renewals \$1.25, transfers \$1.25 and copies \$1.25 each. The additional 25 cents added to the old cost covers the cost of the metal tag which is made out with each certificate. The idea is to try and carry out the purport of the law and while there is an additional charge of 25 cents, the amended section 1 saves at least \$1.00 by eliminating the recorder's fees, so there is really no extra tax.

In section 9 provision is made giving this board the power of investigating any complaint and the re-examination of a stallion if deemed necessary.

THE CALIFORNIA STALLION REGISTRATION LAW.

CHAPTERS 677 (1911) AND 752 (1915).

An act to regulate the public service of stallions and jacks in the State of California, approved May 1, 1911.

[Amended in 1915. Approved June 12, 1915.]

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. Every association, person, firm or corporation standing or offering any stallion or jack for public service in this state shall cause the name, description, and pedigree of such stallion or jack to be enrolled by a stallion registration board hereinafter provided for, and secure a license from said board, as provided in section three of this act. All enrollment and verification of pedigree shall be done in the office of the secretary of the California state board of agriculture.

SEC. 2. In order to carry out the provisions of this act, there shall be constituted a stallion registration board, whose duty it shall be to verify and register pedigrees; to pass upon certificates of veterinary examination; to provide, when necessary, for veterinary inspection; to issue stallion or jack license certificates and tags; to make all necessary rules and regulations; and to perform such other duties as may be necessary to carry out and enforce the provisions of this act. Said board shall hold meetings at the office of the secretary of the California state board of agriculture the first Tuesday and subsequent days of February, May, August and November of each year, and such other meetings as may be necessary. Said stallion registration board shall be composed of three members, consisting of the president and secretary of the California state board of agriculture and the state veterinarian.

SEC. 3. In order to obtain the license certificate and tag herein provided for, the owner of each stallion or jack shall forward an affidavit on a form which shall be furnished by the stallion registration board and this affidavit shall be made by a veterinarian, legally qualified to practice as such in this state, to the effect that he has personally examined such stallion or jack. If said stallion or jack is free from communicable diseases mentioned in section four of this act, a statement to this effect shall be made on said affidavit by the examining veterinarian. If said examining veterinarian after examination finds such stallion or jack affected with any communicable disease or with any of the diseases or unsoundnesses mentioned in section four of this act, a statement shall be inscribed on such affidavit by said veterinarian specifying the disease or unsoundness so found. The owner of said stallion or jack shall also furnish to the stallion registration board the

studbook certificate of registry of the pedigree of said stallion or jack when said stallion or jack is registered, and all other necessary papers relative to his breeding and ownership. Upon verification of pedigree and certificate of breeding (in case of purebred stallions or jacks), and receipt of veterinarian's affidavit as provided for in this act, a license certificate shall be issued to the owner; *provided, however*, that no license certificate shall be issued to the owner of any stallion or jack in case said animal is affected with any communicable disease; *and provided, further*, that when any stallion or jack is found affected with any of the diseases or unsoundnesses as mentioned in section four of this act, the license certificate so issued to the owner of said animal shall specify the disease or unsoundness with which said animal is affected.

SEC. 4. Any stallion or jack found to be affected with any of the following diseases or unsoundness is hereby deemed unsound and likely to transmit such disease or unsoundness to its progeny, and the license certificate issued to the owner of such a stallion or jack shall specify the disease or unsoundness as provided for in section three of this act:

Periodic opthalmia (moon blindness); cataract, laryngeal hemiplegia (roaring or whistling); pulmonary emphysema (heaves, broken wind); chorea (St. Vitus dance, crampiness, shivering, string-halt); bone spavin, ringbone, sidebone, navicular disease, osteoporosis; curb, when accompanied with faulty confirmation of hock.

SEC. 5. The stallion registration board shall make and keep records of all stallions and jacks enrolled in the State of California; said stallions or jacks to be enrolled as "purebred," "crossbred," "non-standard bred," "grade," or "mongrel," according as the facts may have been determined. Upon making the enrollment of said stallion or jack said stallion registration board shall issue the above said license. The stallion registration board is authorized, in cases of emergency, to grant temporary license certificates without veterinary examination, upon receipt of an affidavit of the owner to the effect that, to the best of his knowledge and belief, said stallion or jack is free from infectious, contagious, or transmissible disease or unsoundness. Temporary license certificate shall be valid only until veterinary examination can reasonably be made.

SEC. 6. The owner of any stallion or jack used for public service in this state shall post and keep affixed, during the entire breeding season, a copy of the license certificate of such stallion or jack, issued under the provisions of this act, in a conspicuous place, both within and upon the outside of the main door leading to every stable or building where the said stallion or jack is used for public service, and at all times during the breeding season shall have attached to the harness

or bridle of said stallion or jack a tag which shall be issued with the certificate. Each bill and poster and each newspaper advertisement shall show the enrollment certificate number, and state whether it reads "purebred," "grade," "crossbred," "nonstandard," or "mongrel," and it shall be illegal to print or advertise any misleading reference to the breeding of said stallion or jack, his dam or sire.

SEC. 7. The license certificate issued for a stallion or jack whose sire and dam are of pure breeding, and the pedigree of which is registered in a studbook recognized by said stallion registration board, shall be in the following form:

FORM OF CERTIFICATE.

(Section 7 of Registration Law.)

PUREBRED.

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of purebred stallion or jack, No.-----*The pedigree of the stallion or jack (name)*-----*Owned by*-----*Bred by*-----

Described as follows:

Color -----, breed -----,
foaled in the year -----, has been duly examined and it is hereby
certified that the said stallion or jack is registered as number-----
in ----- studbook, said studbook being recognized by the stallion
registration board of California, and is of pure breeding. The above
named stallion or jack has been examined by -----
veterinarian, and is reported as ----- and is licensed
to stand for public service in the State of California.

This license expires on -----, 19-----.

Signed -----

Secretary California Stallion Registration Board.

Dated this-----, 19-----, at Sacramento, California

GRADE.

The license certificate issued for a grade stallion or jack, whose sire
or dam is not purebred, shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of grade stallion or jack, No.-----*The pedigree of the stallion or jack (name)*-----*Owned by*-----*Bred by*-----

Described as follows:

Color -----, foaled in the year -----, has
been duly examined, and it is hereby certified that the said stallion or
jack is not of pure breeding, and is, therefore, not eligible for regis-
tration in any studbook recognized by the stallion registration board

of California. The above stallion has been examined by _____, veterinarian, and is reported as _____ and is licensed to stand for public service in the State of California.

This license expires on _____, 19____.

Signed _____,
Secretary California Stallion Registration Board.

Dated this _____, 19____, at Sacramento, California.

CROSSBRED.

The license certificate issued for a stallion whose sire and dam are purebred, but not of the same breed, shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of crossbred stallion, No. _____

The pedigree of the stallion (name) _____

Owned by _____

Bred by _____

Described as follows:

Color _____, foaled in the year _____, has been duly examined, and it is found that his sire is registered in the _____ studbook as number _____, volume _____, at page _____, and his dam in the _____ studbook as No. _____, volume _____, and page _____.

Such being the case, the said stallion is not eligible for registration in any studbook recognized by the stallion registration board of California. The above named stallion has been examined by _____, veterinarian, and is reported as _____ and is licensed to stand for public service in the State of California.

This license expires on _____, 19____.

Signed _____,
Secretary California Stallion Registration Board.

Dated this _____, 19____, at Sacramento, California.

NONSTANDARD BRED.

The license certificate issued for a nonstandard bred stallion, shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of nonstandard bred stallion, No.-----*The pedigree of the stallion (name)*-----*Owned by*-----*Bred by*-----

Described as follows:

Color -----, foaled in the year -----, has been duly examined, and it is hereby certified and found that said stallion is not eligible to registration as standard bred, and for the purpose of this license is not purebred, although recorded in the nonstandard department of the American trotting register.

The above named stallion has been examined by -----, veterinarian, and is reported as ----- and is licensed to stand for public service in the State of California.

This license expires on -----, 19-----.

Signed-----,

Secretary California Stallion Registration Board.

Dated this-----, 19-----, at Sacramento, California.

MONGREL.

The license certificate issued for a mongrel stallion or jack shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of mongrel stallion or jack, No.-----*The pedigree, as far as known or traced, of the stallion or jack (name)*-----*Owned by*-----*Bred by*-----

Described as follows:

Color -----, foaled in the year -----, has been duly examined, and it is hereby certified that the said stallion or jack is of mongrel breeding, and is not eligible for registration in any studbook recognized by the stallion registration board of California.

The above named stallion has been examined by -----, veterinarian, and is reported as ----- and is licensed to stand for public service in the State of California.

This license expires on -----, 19-----.

Signed-----,

Secretary California Stallion Registration Board.

Dated this-----, 19-----, at Sacramento, California.

SEC. 8. A fee of two dollars and seventy-five cents shall be paid to the secretary of the California stallion registration board for the examination and enrollment of each stallion or jack pedigree, and for issuance of a license certificate and tag, in accordance with the breeding of the stallion or jack as above provided, which shall be in force and effect for a period of one year from its date, and for the purpose of carrying out the provisions of this act. The fee shall be paid to the secretary of the California registration board at the time the application is made for enrollment. Upon a transfer of the ownership of any stallion or jack enrolled under the provisions of this act, the certificate of enrollment may be transferred to the transferee by the secretary of the California stallion registration board upon submittal of satisfactory proof of such transfer of ownership, and upon payment of a fee of one dollar and twenty-five cents. A fee of one dollar and twenty-five cents shall be paid annually for the renewal of a license certificate and tag. A fee of one dollar and twenty-five cents shall be paid for a duplicate license certificate and tag upon proof of the loss or destruction of the original certificate.

SEC. 9. Whenever at any time the stallion registration board has reason to believe, or complaint is made, that any stallion or jack has been provided with a license certificate under false or erroneous representation, said stallion registration board is hereby authorized and empowered to cause an investigation to be made, and if in the conduct of such investigation it is deemed necessary by said board to examine said stallion or jack, the owner of said animal shall have the right to select a veterinarian, legally qualified to practice as such in this state, to act with a veterinarian of said stallion registration board in examining said animal, and in case these two shall fail to agree on a verdict or decision they shall appoint a third qualified veterinarian, with the consent and approval of said board and owner, which third veterinarian shall act as a referee therein and the decision of said referee shall be final. If, as a result of such investigation or examination, or both, it shall have been found that such stallion or jack is not legally entitled to the license certificate as provided for in this act, then said stallion registration board shall revoke the license in force, or provide the owner of said animal with a proper form of license certificate; *provided*, that the owner of any stallion or jack used for public service in this state shall have a lien on all colts sired by said stallion or jack for the service fee for a period of one year from the date of the foaling of said colt, as now provided by law.

SEC. 10. Every association, person, firm or corporation violating any of the provisions of this act, shall be guilty of a misdemeanor, and

shall be punished by a fine not exceeding one hundred dollars (\$100) for each offense; or by imprisonment in the county jail not exceeding fifty days, or by both such fine and imprisonment.

SEC. 11. The funds accruing from the above named fees shall be used by the said stallion registration board to defray the expenses of enrollment of pedigrees and issuance of licenses; to provide for the examination of stallions and jacks when necessary; to publish reports or bulletins containing lists of stallions and jacks examined, which shall be not less than one in each year; to encourage the horse-breeding interests in this state; to disseminate information pertaining to horse breeding, and for any other purposes as may be necessary to carry out the purposes and enforce the provisions of this act. Each member of the above committee shall receive his actual expenses incurred while in the performance of any duty imposed under the provisions of this act; the secretary of said board shall receive for his services an amount to be fixed and agreed upon by said board. It shall be the duty of the said stallion registration board to enforce the provisions of this act, and to make an annual report, including financial statement, to the governor of the state on September 15th of each year.

SEC. 11½. The secretary of the stallion registration board at least as often as once each month, and oftener if required so to do, shall report to the state controller the total amount of fees collected, and at the same time he shall pay into the state treasury the entire amount of such receipts. All such receipts shall be credited to the stallion registration board contingent fund, which fund is hereby created, and shall be held subject to the uses of the board as defined in this act.

SEC. 12. This act shall take effect and be in force on August 1, 1911.

APPENDIX E.

STATES, HAVING STALLION REGISTRATION LAWS.

State	Name and location
California	Stallion Registration Board, Sacramento
Colorado	State Board of Stock, Inspection Commissioners, Denver
Idaho	Stallion Registration Board, Moscow
Illinois	Stallion Registration Board, Springfield
Indiana	Stallion Registration Board, Lafayette
Iowa	Stallion Registration Board, Des Moines
Kansas	State Livestock Registry Board, Manhattan
Michigan	Agricultural College, East Lansing
Minnesota	Stallion Registration Board, St. Paul
Missouri	Missouri Stallion Registration Board, Columbia
Montana	Bureau of Agriculture, Labor, Industry, and Publicity, Helena
Nebraska	Stallion Registration Board, Lincoln
New Jersey	Stallion Registration Board, New Brunswick
New York	New York Stallion Registration Board, Albany
North Dakota	Stallion Registration Board, Fargo
Oklahoma	Oklahoma State Live Stock Registration Board, Stillwater
Ohio	Division of Stallion Inspection, Columbus
Oregon	Stallion Registration Board, Corvallis
Pennsylvania	Stallion Registration Board, Harrisburg
South Dakota	Stallion Registration Board, Brookings
Utah	Stallion Registration Board, Logan
Washington	Stallion and Jack Registration Office, State College, Pullman
Wisconsin	Stallion Registration Board, Madison

ANNUAL REPORT

OF THE

California

Stallion Registration Board

FOR THE

YEAR ENDING JUNE 30, 1920



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO. 1921

STATE OF CALIFORNIA DEPARTMENT OF AGRICULTURE

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Sacramento

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¹Honorary Members.

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LETTER OF TRANSMITTAL.

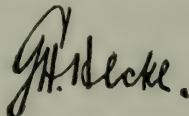
SACRAMENTO, CALIFORNIA, JULY 6, 1921.

HON. WM. D STEPHENS,

*Governor of the State of California,
Sacramento, California.*

SIR: I have the honor to transmit herewith, for your consideration and approval, the Annual Report of the Registration of Stallions of the State of California for the year ending June 30, 1920. This report meets the requirements of Section 11 of an act creating a Stallion Registration Board as amended and approved June 12, 1915. It covers the same ground as the report that was formerly known as the Annual Report of the California Stallion Registration Board, which was consolidated with the State Department of Agriculture in an act approved May 16, 1919.

Very truly yours,

A handwritten signature in dark ink, appearing to read "J. H. Decker". The signature is written in a cursive, flowing style with a large initial "J" and "H".

Director of Agriculture.

REPORT OF STALLION REGISTRATION.

For the year ending June 30, 1920.

FINANCIAL STATEMENT.

July 1, 1919, to June 30, 1920.

SUMMARY.

Receipts.

Cash balance July 1, 1919-----		\$805 19
Amounts received for		
New licenses-----	\$172 75	
Renewals-----	596 25	
Transfers-----	70 00	
		\$839 00
Total-----		\$1,644 19

Disbursements.

Salaries-----	\$681 93	
Service and expense (miscellaneous)-----	55 00	
Printing-----	186 79	
Materials and supplies (miscellaneous)-----	55 36	
Property (equipment)-----	68 75	
		\$1,047 83
Cash balance, June 30, 1920-----		596 36
Total-----		\$1,644 19

INTRODUCTION.

For the year ending June 30, 1920, the State of California has 500 stallions and jacks properly registered and licensed to stand for service. While this number shows a decrease of 14.2 per cent over that for the year 1919, the Division of Animal Industry does not look upon this factor as unfavorable in the face of conditions which have confronted the horse and mule industry.

Stock raisers are more and more fully realizing the distinction between the good and poor sire. It has also been found that the small stallion of undesirable breeding is not worth its weight in dollars and cents for three reasons: poor breeding, high cost of labor and feed, and the low selling value of such an animal on the market today. This may be better brought to mind when you realize there was a falling off of mongrels during the past year of 23 per cent leaving 67 thus classified; whereas, there has been a decrease in the number of grades in 1920 of 25 per cent which leaves a total of 66 such animals. Of the purebred stallions during the past year there has been a decrease of 13, or 5 per cent, leaving 247 purebred stallions which are offered for public service in the state. Of the 130 jacks in 1920, 54, or 41.5 per cent, were purebreds and these figures show a decrease of 5.8 per cent, whereas, in the case of grades, we had 11, or an increase of 3.1 per cent over the number recorded for the past year; as well as in the number of mongrel jacks there were 65, or an increase of 2.7 per cent over that for 1919.

This decrease in horse stock is not only local, but for the whole United States there was a net decrease of approximately 373,000 in horses alone

on the farms on January 1, besides for the year 1919, there was a more marked decrease in the number of mares bred.

The increase in percentages of grade and mongrel jacks is undoubtedly due to demands for more mules. This demand is more easily understood when we take into consideration the heavy inroads made upon our mule population by the late World War. The United States Government alone, from the beginning of the war to November 11, 1918, purchased 123,881 mules. The horse purchases amounted to 181,513, or a total for both horses and mules during that period of 305,394.

The displacement of the horse and mule by motive power is another factor to be considered. While the performance of the tractor has been almost unbelievable, it has not, as yet, proved superior to the horse. The horse is dependable under almost all conditions that the farm demands, in that he is a flexible source of farm power when used singly or in teams of two or more. It has been demonstrated that the horse is the cheapest source of motive power on small ranches and has been found to be the cheapest source of power on short hauls in the city and town. The motor truck is practical only where long hauls with rapid transportation are required, but the horse for the short haul is more practical and operates at a lessened cost of from twenty-five to forty cents on the dollar.

However, all users of horse power demand good, sound, draft horses and mules, and this is accomplished only by the use of good mares and sires. One of the principal factors from which the market is suffering is the breeding of too many low grade work animals. The Division of Animal Industry therefore recommends that horse raisers breed only good, sound mares to registered stallions.

SUMMARY.

Breed	Number									
	1912	1913	1914	1915	1916	1917	1918	1919	1920	
Arab			1	3	5	5	3	3		
Belgian	146	150	135	143	111	98	77	54	36	
Cleveland Bay	1	1								
Clydesdale	29	33	25	22	16	9	8	6	7	
Crossbred	16	6	2	2	3	4	4	2	2	
French Coach	26	23	21	10	8	5	4			
French Draft	57	57	48	46	36	29	22	15	8	
German Coach	65	53	20	32	22	13	7	7	3	
Grade									65	
Hackney	2	4	3	3	2					
Mongrel	766	797	547	350	288	209	115	87	67	
Nonstandard	2	4	3	4	3	3	2	1		
Norman	3	5	4	2	1					
Percheron	419	463	410	437	391	328	247	179	133	
Saddle	10	7	8	10	9	8	5	2		
Shire	94	88	71	72	66	46	36	28	15	
Standard	165	279	208	186	144	75	42	31	17	
Suffolk	1	1	1	1						
Thoroughbred	11	15	8	13	16	17	13	14	11	
Trotter	150	2								
Welsh Pony										
Not classified		13	24		9	9	5	5		
Totals	1,957	1,929	1,552	1,336	1,133	838	590	435	370	
Jacks	77	368	111	245	254	185	173	143	130	
Grand totals	2,034	2,278	1,663	1,631	1,387	1,043	763	583	500	

N. B.—Prior to 1920 grade stallions have been listed with the purebreds of their respective breeds.

RECOGNIZED FOREIGN BREEDS.

The following breeds of horses have been certified to the Secretary of the Treasury as recognized breeds and books of record across seas:

Name of breed	Book of Record	By whom published
Belgian Draft -----	Studbook des Chevaux de Trait Belges--	Society le Cheval de Trait Belge, Chevalier G. Hynderick, secretary, 20 Rue Royale, Brussels, Belgium.
Clydesdale -----	Clydesdale Studbook -----	Clydesdale Horse Society of the United Kingdom of Great Britain and Ireland, Archibald Mc-Neillage, secretary, 93 Hope Street, Glasgow, Scotland.
French Draft -----	Studbook des Chevaux de Trait Francais--	Societe des Agriculteurs de France, J. C. Villevas, secretary, 8 Rue d'Athenes, Paris, France.
Hackney -----	Hackney Studbook -----	Hackney Horse Society, Frank F. Euren, secretary, 12 Hanover Square, London, W., England.
Percheron -----	Studbook Percheron de France-----	La Societe Hippique Percheronne de France, E. Lemarie, secretary, Nogent-le-Rotrou, France.
Shetland Pony -----	Shetland Pony Studbook-----	Shetland Pony Studbook Society, R. W. Walker, secretary, 3 Golden Square, Aberdeen, Scotland.
Shire -----	Shire Horse Society Studbook-----	Shire Horse Society, J. Sloughgrove, secretary, 12 Hanover Square, London, W., England.
Suffolk -----	Suffolk Studbook -----	Suffolk Horse Society, Fred Smith, secretary, Rendlesham, Woodbridge, Suffolk, England.
Thoroughbred -----	Australian Studbook ----- Provides that no animal or animals registered in the Australian Studbook shall be certified as purebred unless such animal or animals trace, in all crosses, to animals registered in the General Studbook of England.	Australian Jockey Club and Victoria Racing Club, A. P. Wilson, keeper, 6 Bligh street, Sidney, New South Wales.
Welsh Pony and Cob--	Welsh Pony and Cob Studbook-----	Weatherby & Sons, 6 Old Burlington street, London, W., England. The Welsh Pony and Cob Society, John R. Bache, secretary, Knighton, Radnorshire, Wales.

Recognized breeds and books of record in Canada.—The Canadian National Records are recognized for the following breeds, provided that no animal or animals registered in the Canadian National Records shall be certified by the Secretary of Agriculture as purebred unless such animal or animals trace, in all crosses, to registered animals in the country where the breed originated, or to animals which are proved to the satisfaction of the department to be of the same breed and which have been imported from the country in which the breed originated:

Belgian Draft
Clydesdale
Hackney
Shire

Standardbred
Suffolk
Thoroughbred
Welsh Pony and Cob

STATES HAVING STALLION REGISTRATION LAWS.

State	Department	Location
California	Division of Animal Industry.....	Sacramento, California
Colorado	State Board of Stock Inspection.....	Denver, Colorado
Idaho	State Live Stock Sanitary Board.....	Boise, Idaho
Illinois	Stallion Registration Board.....	Springfield, Illinois
Indiana	Stallion Registration Board.....	Lafayette, Indiana
Iowa	Department of Agriculture.....	Des Moines, Iowa
Kansas	Live Stock Registry Board.....	Manhattan, Kas.
Michigan	Stallion Registration Board.....	Richmond, Mich.
Minnesota	Stallion Registration Board.....	St. Paul, Minn.
Missouri	Stallion Registry Board.....	Columbia, Missouri
Montana	Stallion Registration Board.....	Bozeman, Montana
Nebraska	Stallion Registration Board.....	Lincoln, Nebr.
New Hampshire	Secretary Board of Agriculture.....	Concord, N. H.
New Jersey	Stallion Registration Board.....	New Brunswick, N. J.
New Mexico	The Cattle Sanitary Board.....	Albuquerque, N. M.
New York	Commissioner of Agriculture.....	Albany, N. Y.
North Dakota	Stallion Registration Board.....	Agricultural College, N. D.
Oklahoma	Oklahoma Live Stock Registry Board.....	Stillwater, Okla.
Oregon	Stallion Registration Board.....	Corvallis, Oregon
Pennsylvania	Live Stock Sanitary Board.....	Harrisburg, Pa.
South Dakota	Live Stock Sanitary Board.....	Pierre, S. Dak.
Utah	Stallion Registration Board.....	Logan, Utah
Vermont	Deputy Live Stock Commissioner.....	Montpelier, Vt.
Washington	Stallion Registration Board.....	Pullman, Wash.
Wisconsin	Department of Horse Breeding.....	Madison, Wis.
Wyoming	State Veterinarian	Cheyenne, Wyo.

THE CALIFORNIA STALLION REGISTRATION LAW.

CHAPTERS 677 (1911) AND 752 (1915).

An act to regulate the public service of stallions and jacks in the State of California, approved May 1, 1911.

[Amended in 1915. Approved June 12, 1915.]

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. Every association, person, firm or corporation standing or offering any stallion or jack for public service in this state shall cause the name, description, and pedigree of such stallion or jack to be enrolled by a stallion registration board hereinafter provided for, and secure a license from said board, as provided in section three of this act. All enrollment and verification of pedigree shall be done in the office of the secretary of the California state board of agriculture.

SEC. 2. In order to carry out the provisions of this act, there shall be constituted a stallion registration board, whose duty it shall be to verify and register pedigrees; to pass upon certificates of veterinary examination; to provide, when necessary, for veterinary inspection; to issue stallion or jack license certificates and tags; to make all necessary rules and regulations; and to perform such other duties as may be necessary to carry out and enforce the provisions of this act. Said board shall hold meetings at the office of the secretary of the California state board of agriculture the first Tuesday and subsequent days of February, May,

August and November of each year, and such other meetings as may be necessary. Said stallion registration board shall be composed of three members, consisting of the president and secretary of the California state board of agriculture and the state veterinarian.

SEC. 3. In order to obtain the license certificate and tag herein provided for, the owner of each stallion or jack shall forward an affidavit on a form which shall be furnished by the stallion registration board and this affidavit shall be made by a veterinarian, legally qualified to practice as such in this state, to the effect that he has personally examined such stallion or jack. If said stallion or jack is free from communicable diseases mentioned in section four of this act, a statement to this effect shall be made on said affidavit by the examining veterinarian. If said examining veterinarian after examination finds such stallion or jack affected with any communicable disease or with any of the diseases or unsoundnesses mentioned in section four of this act, a statement shall be inscribed on such affidavit by said veterinarian specifying the disease or unsoundness so found. The owner of said stallion or jack shall also furnish to the stallion registration board the studbook certificate of registry of the pedigree of said stallion or jack when said stallion or jack is registered, and all other necessary papers relative to his breeding and ownership. Upon verification of pedigree and certificate of breeding (in case of purebred stallions or jacks), and receipt of veterinarian's affidavit as provided for in this act, a license certificate shall be issued to the owner; *provided, however*, that no license certificate shall be issued to the owner of any stallion or jack in case said animal is affected with any communicable disease; *and provided, further*, that when any stallion or jack is found affected with any of the diseases or unsoundnesses as mentioned in section four of this act, the license certificate so issued to the owner of said animal shall specify the disease or unsoundness with which said animal is affected.

SEC. 4. Any stallion or jack found to be affected with any of the following diseases or unsoundness is hereby deemed unsound and likely to transmit such disease or unsoundness to its progeny, and the license certificate issued to the owner of such a stallion or jack shall specify the disease or unsoundness as provided for in section three of this act:

Periodic ophthalmia (moon blindness); cataract, laryngeal hemiplegia (roaring or whistling); pulmonary emphysema (heaves, broken wind); chorea (St. Vitus dance, crampiness, shivering, string-halt); bone spavin, ringbone, sidebone, navicular disease, osteoporosis; curb, when accompanied with faulty confirmation of hock.

SEC. 5. The stallion registration board shall make and keep records of all stallions and jacks enrolled in the State of California; said stallions or jacks to be enrolled as "purebred," "crossbred," "nonstandard bred," "grade," or "mongrel," according as the facts may have been determined. Upon making the enrollment of said stallion or jack said stallion registration board shall issue the above said license. The stallion registration board is authorized, in cases of emergency, to grant temporary license certificates without veterinary examination, upon receipt of an affidavit of the owner to the effect that, to the best of his knowledge and belief, said stallion or jack is free from infectious, contagious, or transmissible disease or unsoundness. Temporary license certificate shall be valid only until veterinary examination can reasonably be made.

SEC. 6. The owner of any stallion or jack used for public service in this state shall post and keep affixed, during the entire breeding season, a copy of the license certificate of such stallion or jack, issued under the provisions of this act, in a conspicuous place, both within and upon the outside of the main door leading to every stable or building where the said stallion or jack is used for public service, and at all times during the breeding season shall have attached to the harness or bridle of said stallion or jack a tag which shall be issued with the certificate. Each bill and poster and each newspaper advertisement shall show the enrollment certificate number, and state whether it reads "purebred," "grade," "crossbred," "nonstandard," or "mongrel," and it shall be illegal to print or advertise any misleading reference to the breeding of said stallion or jack, his dam or sire.

SEC. 7. The license certificate issued for a stallion or jack whose sire and dam are of pure breeding, and the pedigree of which is registered in a studbook recognized by said stallion registration board, shall be in the following form:

FORM OF CERTIFICATE.

(Section 7 of Registration Law.)

PUREBRED.

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of purebred stallion or jack, No.-----

The pedigree of the stallion or jack (name)-----

Owned by-----

Bred by-----

Described as follows:

Color, -----, breed -----,
foaled in the year -----, has been duly examined and it is hereby
certified that the said stallion or jack is registered as number -----
in ----- studbook, said studbook being recognized by the stallion
registration board of California, and is of pure breeding. The above
named stallion or jack has been examined by -----
veterinarian, and is reported as ----- and is licensed
to stand for public service in the State of California.

This license expires on -----, 19-----.

Signed -----

Secretary California Stallion Registration Board.

Dated this -----, 19-----, at Sacramento, California.

GRADE.

The license certificate issued for a grade stallion or jack, whose sire or dam is not purebred, shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of grade stallion or jack, No. -----

The pedigree of the stallion or jack (name) -----

Owned by -----

Bred by -----

Described as follows:

Color -----, foaled in the year -----, has been duly examined, and it is hereby certified that the said stallion or jack is not of pure breeding, and is, therefore, not eligible for registration in any studbook recognized by the stallion registration board of California. The above stallion has been examined by -----, veterinarian, and is reported as ----- and is licensed to stand for public service in the State of California.

This license expires on -----, 19-----.

Signed -----

Secretary California Stallion Registration Board.

Dated this -----, 19-----, at Sacramento, California.

CROSSBRED.

The license certificate issued for a stallion whose sire and dam are purebred, but not of the same breed, shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of crossbred stallion, No. -----

The pedigree of the stallion (name) -----

Owned by -----

Bred by -----

Described as follows:

Color -----, foaled in the year -----, has been duly examined, and it is found that his sire is registered in the ----- studbook as number -----, volume -----, at page -----, and his dam in the ----- studbook as No. -----, volume -----, and page -----.

Such being the case, the said stallion is not eligible for registration in any studbook recognized by the stallion registration board of Cali-

fornia. The above named stallion has been examined by _____, veterinarian, and is reported as _____ and is licensed to stand for public service in the State of California.

This license expires on _____, 19____.

Signed _____
Secretary California Stallion Registration Board.

Dated this _____, 19____, at Sacramento, California.

NONSTANDARD BRED.

The license certificate issued for a nonstandard bred stallion shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of nonstandard bred stallion, No. _____

The pedigree of the stallion (name) _____

Owned by _____

Bred by _____

Described as follows:

Color _____, foaled in the year _____, has been duly examined, and it is hereby certified and found that said stallion is not eligible to registration as standard bred, and for the purpose of this license is not purebred, although recorded in the nonstandard department of the American trotting register.

The above named stallion has been examined by _____, veterinarian, and is reported as _____ and is licensed to stand for public service in the State of California.

This license expires on _____, 19____.

Signed _____
Secretary California Stallion Registration Board.

Dated this _____, 19____, at Sacramento, California.

MONGREL.

The license certificate issued for a mongrel stallion or jack shall be in the following form:

CALIFORNIA STALLION REGISTRATION BOARD.

Certificate of mongrel stallion or jack, No. _____

The pedigree, as far as known or traced, of the stallion or jack (name) _____

Owned by _____

Bred by _____

Described as follows :

Color _____, foaled in the year _____, has been duly examined, and it is hereby certified that the said stallion or jack is of mongrel breeding, and is not eligible for registration in any studbook recognized by the stallion registration board of California.

The above named stallion has been examined by _____, veterinarian, and is reported as _____ and is licensed to stand for public service in the State of California.

This license expires on _____, 19____.

Signed _____

Secretary California Stallion Registration Board.

Dated this _____, 19____, at Sacramento, California.

SEC. 8. A fee of two dollars and seventy-five cents shall be paid to the secretary of the California stallion registration board for the examination and enrollment of each stallion or jack pedigree, and for issuance of a license certificate and tag, in accordance with the breeding of the stallion or jack as above provided, which shall be in force and effect for a period of one year from its date, and for the purpose of carrying out the provisions of this act. The fee shall be paid to the secretary of the California registration board at the time the application is made for enrollment. Upon a transfer of the ownership of any stallion or jack enrolled under the provisions of this act, the certificate of enrollment may be transferred to the transferee by the secretary of the California stallion registration board upon submittal of satisfactory proof of such transfer of ownership, and upon payment of a fee of one dollar and twenty-five cents. A fee of one dollar and twenty-five cents shall be paid annually for the renewal of a license certificate and tag. A fee of one dollar and twenty-five cents shall be paid for a duplicate license certificate and tag upon proof of the loss or destruction of the original certificate.

SEC. 9. Whenever at any time the stallion registration board has reason to believe, or complaint is made, that any stallion or jack has been provided with a license certificate under false or erroneous representation, said stallion registration board is hereby authorized and empowered to cause an investigation to be made, and if in the conduct of such investigation it is deemed necessary by said board to examine said stallion or jack, the owner of said animal shall have the right to select a veterinarian, legally qualified to practice as such in this state, to act with a veterinarian of said stallion registration board in examining said animal, and in case these two shall fail to agree on a verdict or decision they shall appoint a third qualified veterinarian, with the consent and approval of said board and owner, which third veterinarian shall act as a referee therein and the decision of said referee shall be final. If, as a result of such investigation or examination, or both, it shall have been found that such stallion or jack is not legally entitled to the license certificate as provided for in this act, then said stallion registration board shall revoke the license in force, or provide the owner of

said animal with a proper form of license certificate; *provided*, that the owner of any stallion or jack used for public service in this state shall have a lien on all colts sired by said stallion or jack for the service fee for a period of one year from the date of the foaling of said colt, as now provided by law.

SEC. 10. Every association, person, firm or corporation violating any of the provisions of this act, shall be guilty of a misdemeanor, and shall be punished by a fine not exceeding one hundred dollars (\$100) for each offense; or by imprisonment in the county jail not exceeding fifty days, or by both such fine and imprisonment.

SEC. 11. The funds accruing from the above named fees shall be used by the said stallion registration board to defray the expenses of enrollment of pedigrees and issuance of licenses; to provide for the examination of stallions and jacks when necessary; to publish reports or bulletins containing lists of stallions and jacks examined, which shall be not less than one in each year; to encourage the horse-breeding interests in this state; to disseminate information pertaining to horse breeding, and for any other purposes as may be necessary to carry out the purposes and enforce the provisions of this act. Each member of the above committee shall receive his actual expenses incurred while in the performance of any duty imposed under the provisions of this act; the secretary of said board shall receive for his services an amount to be fixed and agreed upon by said board. It shall be the duty of the said stallion registration board to enforce the provisions of this act, and to make an annual report, including financial statement, to the governor of the state on September 15th of each year.

SEC. 11½. The secretary of the stallion registration board at least as often as once each month, and oftener if required so to do, shall report to the state controller the total amount of fees collected, and at the same time he shall pay into the state treasury the entire amount of such receipts. All such receipts shall be credited to the stallion registration board contingent fund, which fund is hereby created, and shall be held subject to the uses of the board as defined in this act.

SEC. 12. This act shall take effect and be in force on August 1, 1911.

At the session of 1916-1917 of the legislature the bill entitled, "An act to regulate the public service stallions and jacks in the State of California," was amended in sections 1, 2, 3, 4, 6, 7, 8 and 9, and added a new section, which is numbered 11½. These amended sections change the law in a number of places and should be carefully read.

In section 1 of the old law the last sentence is struck out. It is not necessary now to have the license recorded with the county recorder. This will save the cost of recorder's fee.

In section 2 the words, "and tags," have been added after the words, "stallion or jack license certificates." This means that when a certificate is issued there will also be a metal tag issued bearing the certificate number and designating whether it is purebred, grade, crossbred, non-standard or mongrel.

In section 3 provision is made for the veterinarian to specify on the affidavit if the stallion or jack is affected with any communicable disease or with any of the diseases or unsoundnesses mentioned in section 4 of this act.

In section 4 certain diseases or affections have been added in the amendment and a part of those given in the old law have been dropped.

Section 5 has not been changed.

Section 6 makes provision for the metal tag above mentioned to be placed upon the harness or bridle at all times during the breeding season.

In section 7 of the old law the studbooks used were the ones recognized by the United States Department of Agriculture, Washington, D. C. This is changed to read "Studbook recognized by said stallion registration board." This wording also appears in the certificates.

In section 8 the fees for new registrations, transfers and copies have been changed. New certificates are now \$2.75, renewals \$1.25, transfers \$1.25 and copies \$1.25 each. The additional 25 cents added to the old cost covers the cost of the metal tag which is made out with each certificate. The idea is to try and carry out the purport of the law and while there is an additional charge of 25 cents, the amended section 1 saves at least \$1.00 by eliminating the recorder's fees, so there is really no extra tax.

In section 9 provision is made giving this board the power of investigating any complaint and the reexamination of a stallion if deemed necessary.

Summary of the Number of Stallions and Jacks by Counties.

Counties	Stallions						Jacks			
	Purebred	Grade	Crossbred	Non-standard	Mongrel	Total	Purebred	Grade	Mongrel	Total
Alameda	8	3			2	13				
Amador	1					1				
Butte	1	2			2	5	1		1	2
Calaveras		2				2			2	2
Colusa		3			1	4	2	3	1	6
Contra Costa	12		1			13	2			2
El Dorado	1					1				
Fresno	8	6			5	19	5	1	3	12
Glenn	2					2	3			3
Humboldt	6	1			5	12			1	1
Imperial	1				4	5	3		4	7
Inyo	2					2	1			1
Kern	5	2			6	13	4		3	7
Kings	2				1	3	1		1	2
Lake	1				1	2				
Lassen	3					3				
Los Angeles	18				2	20	4		2	6
Madera	1					1	2			2
Marin	3	1				4		1		1
Mendocino	2	4			1	7			1	1
Merced	5					5			4	4
Modoc	2					2				
Monterey	8				2	10	1		1	2
Napa	4					4				
Nevada	1					1				
Orange	2	1				3	2		2	4
Placer	2	2			1	5			1	1
Plumas	1					1				
Riverside	8				1	9	4		2	6
Sacramento	3	4			1	8			1	1
San Benito	3	2			3	8				
San Bernardino	1				1	2	1			1
San Diego	2				4	7	1			2
San Francisco	4					4				
San Joaquin	22	4			2	29	2		7	9
San Luis Obispo	14	4			3	21	1		1	2
Santa Barbara	6	5				11	2			2
Santa Clara	5	6			1	12			1	1
Santa Cruz	3					3				
Shasta	1					1			1	1
Sierra		1				1				
Siskiyou	8					8			2	2
Solano	8				2	10	1		2	3
Sonoma	7	5	1		1	14				
Stanislaus	6				6	12			7	7
Sutter	2	2				4	1	2		3
Tehama	4					4			3	3
Tulare	13				3	16	7	2	3	12
Tuolumne	1				3	4				
Ventura	5				1	6		1	2	3
Yolo	8	2			1	7	2		2	4
Yuba	3	5				6	1		1	2
Totals	235	63	2		67	370	54	11	65	130

Classified Summary of Purebred Stallions by Breeds.

Counties	Belgian	Olydesdale	French Draft	German Coach	Percheron	Shire	Standard	Arabian	Thorough- bred	Total
Alameda	2		1		3	2				8
Amador					1					1
Butte					1					1
Contra Costa			1		5	4		2		12
El Dorado					1					1
Fresno	1		1		5		1			8
Glenn	1				1					2
Humboldt					4		2			6
Imperial	1									1
Inyo					2					2
Kern	2				3					5
Kings			1		1					2
Lake					1					1
Lassen	1				2					3
Los Angeles	1				9		2	3	3	18
Madera					1					1
Marin				1	1				1	3
Mendocino				1	1					2
Merced	1				3		1			5
Modoc					2					2
Monterey	2				4	1	1			8
Napa			1		1	2				4
Nevada					1					1
Orange					2					2
Placer			1		1					2
Plumas	1									1
Riverside	2				5		1			8
Sacramento					2		1			3
San Benito	1				1	1				3
San Bernardino					1					1
San Diego					2				1	3
San Francisco	1						1		2	4
San Joaquin	1				19		1		1	22
San Luis Obispo	1	2			9		2			14
Santa Barbara	2	2			2					6
Santa Clara					4		1			5
Santa Cruz	1		1		1					3
Shasta									1	1
Siskiyou	3				4		1			8
Solano		1	1		3	2	1			8
Sonoma					6	1				7
Stanislaus	1	1			4					6
Sutter	1				1					2
Tehama	2	1			1					4
Tulare	5			1	5	2				13
Tuolumne					1					1
Ventura					1				1	5
Yolo	1				1		1			3
Yuba	1				1				1	3
Totals	36	7	8	3	133	15	17	5	11	235

Classified Summary of Grade Stallions by Breeds.

Counties	Belgian	Clydesdale	French Draft	German Coach	Percheron	Shire	Standard	Unclassified	Total
Alameda	2				1				3
Butte			1				1		2
Calaveras					1				2
Colusa	2				1				3
Fresno	1		1		2	1	1		6
Humboldt				1					1
Kern	2								2
Marin	1								1
Mendocino	2				2				4
Orange					1				1
Placer					2				2
Sacramento					4				4
San Benito					1			1	2
San Joaquin					2		2		4
San Luis Obispo	1				1	2			4
Santa Barbara		1			3	1			5
Santa Clara	2				3	1			6
Sierra	1								1
Sonoma	1				2	2			5
Sutter			1		1				2
Yolo	1				2				3
Yuba					1		2		3
Totals	16	1	2	1	30	7	7	1	66

DIRECTORY OF LICENSED JACKS IN THE STATE OF CALIFORNIA.

July 1, 1919 to June 30, 1920.

BUTTE COUNTY.

Purebreds.

License Number	Name and address of owner	Name of jack
1464—	Elkins & Milligan, Honcut	Frank McClintock

Mongrels.

619—	Gianella Land Company, Nord	Yuba Boy
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CALAVERAS COUNTY.

Mongrels.

656—	Botto, Luke, Vallecito	Jim
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COLUSA COUNTY.

Purebreds.

1463—	Blevins, C. W., Williams	Jumbo Jr. 12734
1403—	Maham, F. M., Grimes	Klondyke 7754

Grades.

453—	Cecil, L., Grimes	Grey Eagle
454—	Cecil, L., Grimes	Brigham Young
430—	Poe, Geo., Williams	Jauneau

Mongrels.

640—	Arvedsen, Chas. A., College City	Clondyke
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CONTRA COSTA COUNTY.

Purebreds.

1444—	Brentwood Jack Association, Brentwood	Kentucky Wonder 2603
1620—	Los Robles Dairy Co., Contra Costa	Pay Down 2101

FRESNO COUNTY.

Purebreds.

1374—	Bisi, August, Fresno	Jumbo 20355
1621—	Chamberlain, Jerry, Laton	Cyclone "E"
1591—	Eversoll, Wm., Burrough	Christine's Joe Shelby 4145
1540—	Harmon, S. D., Fresno	Stonewall Jackson 7898
2186—	Hill, J. A., Riverdale	Burrells Hercules 8466
1553—	Whiton, F. E., Clovis	Gov. Beecher 7954

Grades.

423—	Woy, M. L., Fresno	Commodore Perry
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Mongrels.

710—	DiDonato, B., Clovis	K George
698—	Gavette, Ray S., Lanare	Sunny Jim
2123—	Lantz, Samuel J., Fresno	Chanpetteepee Jack
631—	Pfost, G. W. & Son, Laton	Denmark
636—	Shannon Estate, Burrel	Ponchito
678—	Simpson, Marvin, Academy	Stamboul
2135—	Piercy, O. V., Sanger	Pedro

GLENN COUNTY.

Purebreds.

License Number	Name and address of owner	Name of Jack
1439—	Flood, J. F., Newville	Brigham Jr. 20278
1440—	Flood, J. T., Newville	Jess Crouch 5515
1504—	Merrill, Morris A., Willows	Joe 21097

HUMBOLDT COUNTY.

Mongrels.

605—	Linser, Ernest R., Gerberville	Pete
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IMPERIAL COUNTY.

Purebreds.

1391—	Carter, Frank, El Centro	Black Boy 6617
1353—	Grummer, L. O., Brawley	Jumbo 11570
1571—	Hogan, John, Seeley	Blue Pete 12691
2195—	Ray, James A., Holtville	Black Prince 2098

Mongrels.

2125—	Anderson, Dee S., Imperial	Black Tom
651—	Byram, L. C., Brawley	Mitchell
2129—	Brockman, C. W., Mt. Signal	Jack
716—	Moore, W. S., El Centro	Ben
635—	Ray, James A., Holtville	Don
674—	St. Louis, H. B., Norman	Tom

INYO COUNTY.

Purebreds.

1447—	Yandell & Summers, Poleta	Steve Gray 12810
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KERN COUNTY.

Purebreds.

1364—	Bone, J. A., Bakersfield	Melroy's Pride 2103
1433—	Gibson Jack Co., Wasco	Round Trip 5599
1394—	Ruedy Chris, Bakersfield	D. T. Matlock 9386
2184—	Ruedy, Chris, Bakersfield	Ruedy's Pride IV 24363
1434—	Vineland Stock Co., Bakersfield	Joe Tribble 5606

Mongrels.

718—	Ashe, R. S., Bakersfield	The Boy
720—	Castro, Luceano, Bakersfield	Enos
2134—	Vineland Stock Co., Bakersfield	King Philip

KINGS COUNTY.

Purebreds.

1524—	Sargent, E. W., Hanford	Seal 2335
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Mongrels.

2116—	Kendall, Clare C., Lemoore	Dandy
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LOS ANGELES COUNTY.

Purebreds.

1371—	Baldwin, Anita, Santa Anita	King Bersheba 5585
2182—	Bixby, Fred H., Long Beach	Henry II 13817
1350—	Brill, William, Los Angeles	Native Son 20566
1388—	Rowland, W. R., Puente	Knox 9189

Mongrels.

2124—	Morrow, W. H., Downey	Black Bob
2126—	Roberts, Earl, Lancaster	Bob

MADERA COUNTY.**Purebreds.**

License Number	Name and address of owner	Name of jack
1494—	Galeener, John M., Madera	Giant Paymaster 24115
1490—	McDonald, J. B., O'Neals	Ben Hur 5664

MENDOCINO COUNTY.**Mongrels.**

631—	Hill, J. R., and Johnson, C. H.	Panama
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MERCED COUNTY.**Mongrels.**

616—	Baxter, G. W., LeGrande	April Fool
699—	LeGrande Jack Association, LeGrande	Solomon
2115—	Menzel, Robert, Ingomar	***
2130—	Ragsdale, James T., Merced	Dewey
2114—	Rahilly, R. E., Merced	Sandy Mush

MONTEREY COUNTY.**Purebreds.**

1597—	Casey, Wm. & Blair, Wm., San Lucas	President Taft
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Mongrels.

2119—	Greenleaf, H., San Lucas	Jack
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ORANGE COUNTY.**Purebreds.**

1542—	Clinard, B. P., El Toro	Captain Woods 22003
1645—	Johnson, H. E., Santa Ana	Bradley's Nero 7901
1351—	Rosenbaum, O., San Juan Capistrano	Big Jeff 20354

Mongrels.

626—	The Irvine Co., Tustin	Wilson
627—	The Irvine Co., Tustin	Bryan

PLACER COUNTY.**Mongrels.**

617—	Anderson, P. C., Roseville	Sampson
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RIVERSIDE COUNTY.**Purebreds.**

1377—	Brown, L. V. W., Riverside	Givens Pride 12623
1378—	Brown, L. V. W., Riverside	Dock 13206
1450—	Keil, W. F., San Jacinto	Raggo Fred 3006
2163—	Sentenev, J. A., San Jacinto	Starlight Junior 11797
2198—	Martin, H. B., Perris	Silver Crown 3rd 2652

Mongrels.

647—	Mapes, M. L., Perris	Monarch
2136—	Cantarini, Angelo, Armada	Jack Cantarini

SACRAMENTO COUNTY.**Purebreds.**

1648—	King, Harvey, Herald	King Pin 16429
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SAN BERNARDINO COUNTY.**Purebreds.**

2176—	Loeher, Dr. W. E., Chino	Ruedy's Pride III 24360
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SAN DIEGO COUNTY.

Purebreds.

License Number	Name and address of owner	Name of Jack
1417—	Hutching, A. H., San Diego	Matlocks duca 2nd 4397

Mongrels.

721—	Kelso, S. S., Palm City	Big Jerry
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SAN JOAQUIN COUNTY.

Purebreds.

1496—	Dill Bros., Clements	Stylish John 12210
1442—	Sayles Bros., Linden	Black Percy

Mongrels.

660—	Beckwith, Harvey, Bethany	Little Jumbo
706—	Harris, L., Escalon	Johnnie
684—	Kelley, C., Lodi	Taft
682—	Moy, Peter, Stockton	Big Tom
2121—	Ohm, John, Vernallis	Murphy
2122—	Ohm, Thos. P., Vernallis	Moses
670—	Sutcliff & Allenbaugh, Manteca	Monty

SAN LUIS OBISPO COUNTY.

Purebreds.

1459—	Stevenson, M. S., San Miguel	Tom 22570
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Grades.

410—	Albright, Charles, Paso Robles	Bobby
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SANTA BARBARA COUNTY.

Purebreds.

2178—	Silveria, M. P., Santa Maria	Teddy 13706
2179—	Ferini, J. R., Orcutt	Divine David 16017

SANTA CLARA COUNTY.

Mongrels.

690—	Hansen, Jos., Milpitas	Frank Helms
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SHASTA COUNTY.

Mongrels.

711—	Beidman, H. P., Cottonwood	Joe Genilla
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SISKIYOU COUNTY.

Mongrels.

671—	Cross, Walter, Dorris	Jack
664—	Hovendon, Walter, Etna Mills	Acey

SOLANO COUNTY.

Purebreds.

1412—	Robben, F. W., Dixon	King Dixon 15270
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Mongrels.

704—	Blacklock, Walter, Suisun	Teddy R
676—	Chadbourn, J. C., Fairfield	Jack

STANISLAUS COUNTY.

Mongrels.

License Number	Name and address of owner	Name of jack
607—Boone, S. J., Newman	-----	Ingo
713—Chatton, A. G., Turlock	-----	Coley
628—Fenton, H. P., Newman	-----	Blue Jay
663—Klehn, W. H., and Hansen, I. C., Newman	-----	Joe
707—Osuna, Claude, Newman	-----	Bluebird
708—Osuna, Claude, Newman	-----	Elkhorn
703—Osuna, Claude, Newman	-----	Brownie

SUTTER COUNTY.

Purebreds.

1487—Darrach, P. A., Pleasant Grove	-----	Orphan Boy 2162
1595—Worth, James, Nicolaus	-----	Pat Crow 2607

Mongrels.

455—King, J. F., Sutter City	-----	Black Hawk
644—Michel, F. J., Nicolaus	-----	Bismarck

TEHAMA COUNTY.

Mongrels.

621—Brockman, A. H., Los Molinos	-----	Peter
685—Clark, Henry, Corning	-----	Nip
662—Goodrun, J. M., Red Bluff	-----	Snip

TULARE COUNTY.

Purebreds.

1521—Adams, John, Dinuba	-----	Diamond Dick 2897
1451—Avery, C. K., Farmersville	-----	Kentucky's Inca 5584
1543—Cornell, E. C., Tipton	-----	California Monarch 6590
1574—Martin, W. L., Visalia	-----	Rusaw 5043
2154—Merritt & Bowers, Tulare	-----	Jim Jeffries 3470
1460—Farr, Walter A., Tulare	-----	King Pin of Laton (Initiatory)
1575—Sharp, Victor R., Visalia	-----	Felix 13167

Grades.

2056—Merritt & Bowers, Tulare	-----	Lord Denmark
472—Witten, L., Visalia	-----	Jumbo

Mongrels.

715—Hickman, H. G., Oroshi	-----	Sampson
578—Kanawyer, Arthur, Traver	-----	Jasper
2133—Soultis, R. J., Tulare	-----	Jack
666—Thompson, J. M., Angiola	-----	Mocking Bird
665—Williams, Park, Dinuba	-----	Martin

VENTURA COUNTY.

Mongrels.

610—Boone, E. W., Somis	-----	Jack
688—Coates, E. O., Santa Paula	-----	Taylor's Duke
2059—Coates, E. O., Santa Paula	-----	Monarch Duke

YOLO COUNTY.

Purebreds.

1531—Campbell, Frank, Davis	-----	Compound Alexander 3298
1532—Campbell, Frank, Davis	-----	Moss 4075

Mongrels.

701—Reusch, Fred E., Zamora	-----	Tom L. Smith
2118—Fredale & Robison, Yolo	-----	Lappy

YUBA COUNTY.

712—Breeden, Mrs. Mary, Marysville	-----	Sam
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LICENSED STALLIONS IN CALIFORNIA.

Year ending July 31, 1920.

ALAMEDA COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1623—	Corniff, James E., Livermore	Jean Bart 51747	Percheron
1375—	Goulart, H., Pleasanton	Enoch 23638	French Draft
1363—	Livermore Belgian Horse Co., Livermore	Jules Dezulta 4460	Belgian
1486—	Livermore Belgian Horse Co., Livermore	Koloh 93418	Percheron
1643—	MacKenzie, R. J., Pleasanton	Vernon McKinney 53803	Standard
2153—	Mohr, H. P., Pleasanton	Blackhawk Forest King 17434	Shire
1397—	Mohr, H. P., Pleasanton	Gomer 6757	Shire
1554—	Silva, John F., Newark	Japonais 5060	Belgian
1152—	Summit Percheron Horse Co., Altamont	Karton 88593	Percheron

Nonstandard.

8—MacKenzie, R. J., Pleasanton—The Anvil * * *

Grades.

451—	DeKidos, Domingos, Mt. Eden	Charley	Belgian
458—	Gomes Bros., Livermore	Little Giant	Percheron
474—	Luiz, Tony D., Niles	Doman	Belgian

Mongrels.

668—	Rasmussen, Herman J., Hayward	Jerry	Mongrel
622—	Soito, Joe S., Pleasanton	Jet	Mongrel

AMADOR COUNTY.

Purebreds.

1500—	Irelan, Bert, Jackson	Major 47923	Percheron
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BUTTE COUNTY.

Purebreds.

1513—	Franklin, J. A., Durham	Jaseur 87206	Percheron
2194—	Friesleben Estate Co., Oroville	Radium 131334	Percheron

Grades.

452—	Laney, Asa, Gridley	Freddie	French Coach
426—	Simpson, G. H., Honcut	Bronze McKinney	Standard
476—	Turner, Angus, Chico	Prince	Percheron

Mongrels.

620—	Gianella, Thos. A., Honcut	Barney	Mongrel
649—	Milligan, A. W., Bangor	Dude	Mongrel

CALAVERAS COUNTY.

Grades.

470—	Breeze, Wm., Jenny Lind	Alto Arabian	Standard
416—	Kennedy, W. E., Burson	Duke	Percheron

COLUSA COUNTY.

Grades.

403—	Aroedsen, Chas., College City	Mastic Junior	Belgian
442—	Blevins, C. W., Williams	Prince Tom	Percheron
424—	Maham, F. M., Grimes	Nemo	Belgian

Mongrels.

680—	Hawk, F. S., Grimes	McAntara	Mongrel
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CONTRA COSTA COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1482	Avila, S. S., Concord	Harbora Combination	28357 Shire
1604	Balfour-Guthrie Investment Co., Brentwood	Hazon II 90501	Percheron
1398	Bishop Bros., San Ramon	Pedro of Palcines 23568	French Draft
1615	Black Hawk Ranch, Diablo	Madcap 15960	Shire
1616	Black Hawk Ranch, Diablo	Dovecote King 15957	Shire
1617	Easton & Ward, Diablo	Salvador Conqueror 15944	Shire
1421	Higgins, Lee, Sr., Antioch	Miroir 105295	Percheron
1580	Periera, Manuel, Martinez	Kirch 35222	Percheron
2164	Thomson, S. C., Concord	El Sabok 276	Arabian
1416	Thomson, S. C., Concord	El Jafil 74	Arabian
1419	Wheelihan, E. B., Antioch	Meñant 45970	Percheron
1562	Williams, Joseph, Concord	Machefer 107861	Percheron

Crossbred.

15—Pereira, M. E., Martinez	Ban	Crossbred
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EL DORADO COUNTY.

Purebreds.

1488—Carlson, A., Camino	Sultan 70306	Percheron
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FRESNO COUNTY.

Purebreds.

1380—Andrews, F. A., Riverdale	Calbrenca 2779	Belgian
1430—Goodrich, C. F., Tranquility	Clair De Lune 61965	Percheron
1652—Nelson, J. H., Selma	Expressive Mac 41523	Standard
1493—Poytress, J. A., Oleander	Banquette 69177	Percheron
1512—Simpson, Marvin, Academy	Majeur 105298	Percheron
1525—Strahan, Columbus, Laton	Joe Beall 30315	French Draft
1558—Wilson, James H., Parlier	Modal 105296	Percheron
1438—Wildermuth Bros., Selma	Roderic 40541	Percheron
1402—Woy, M. L., Fresno	Stanford McKinney 45173	Standard

Grades.

466—Eversoll, Wm., Burrough	Billy Taft	Percheron
441—Frisch, Peter, Fresno	Brigadier	Percheron
433—Glover, G. N., Selma	Bill	Belgian
438—Grant, G. W., Sanger	Prince	Standard
404—Harnish, C. M., Laton	Prince Albert	Shire
427—Thomas, T. O., Laton	Colonel	French Draft

Mongrels.

604—Bisi, Augusti, Fresno	Roger Bon Temp	Mongrel
641—Harnish, G. M., Laton	Balleau	Mongrel
623—Lazy H Ranch Co., Sanger	Wawa	Mongrel
624—Long, Frank, Reedley	Black Diamond	Mongrel
648—Oliver, Robt., Oleander	Dave	Mongrel

GLENN COUNTY.

Purebreds.

1505—Merrill, M. A., Willows	Chatelet 40559	Percheron
1633—Simpson, B. F., Orland	Egmont 5536	Belgian

HUMBOLDT COUNTY.

Purebreds.

1401—Anderson, Jaspier, Hydesville	Janvier 41246	Percheron
1495—Colegrove, Francis, Hoopa	Sir Poleon 52065	Standard
1336—Kempf, Ed., Carlotta	Cassene 41365	Standard
1387—Linsler, Ernest R., Gerberville	Tobin 52496	Belgian
1622—McLaughlin B., Eureka	Loris	Percheron
1437—Rohnerville Per. Horse Co., Rohnerville	Idumeen 90245	Percheron

Grades.

415—Jenks, E. A., Alderpoint	Prince	German Coach
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Mongrels.

697—Cox, Geo. W., Blockburg	Bill Morgan	Mongrel
655—Edeline, P. O., Waddington	Trojan	Mongrel
611—Northern Redwood Lumber Co., Korbel	Prince Albert	Mongrel
612—Northern Redwood Lumber Co., Korbel	Jeff	Mongrel

IMPERIAL COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1390—	Carter, Frank, El Centro	Noirhat Bengali 6815	Belgian

Mongrels.

2113—	Dye, John, Calexico	Blondy	Mongrel
673—	Forrester, E. E., El Centro	Sam Sr.	Mongrel
667—	Schooling, Joseph, Brawley	Major	Mongrel

INYO COUNTY.

Purebreds.

1563—	Bell, Joseph G., Bishop	Haversac 44769	Percheron
1545—	Garner, G. W., Bishop	Kab 87292	Percheron

KERN COUNTY.

Purebreds.

1626—	Brite, F. M., Tehachapi	Iras 61351	Percheron
1349—	Corsett, R. H., Bakersfield	Corcoran B 5063	Belgian
1538—	Rio Brava & Rosedale Horse Association, Bakersfield	Konsulat 93366	Percheron
2165—	Ruedy, Chris, Bakersfield	Dewey 11158	Belgian
1506—	Taylor, H. L., McFarland	Halot 70272	Percheron

Mongrels.

719—	Ashe, R. S., Bakersfield	Chief	Mongrel
659—	Clendenen, O. B., Bakersfield	Friday	Mongrel
653—	Hathway, Howard, Bakersfield	Yellowstone	Mongrel
661—	Odett, Percy, Lebec	Pat	Mongrel
692—	Tobler & Tschurr	Teddy	Mongrel
672—	Wafford, Irwin L., Lorraine	Ranger	Mongrel

Grades.

450—	Azevedo, A. G., Bakersfield	Dick	Belgian
456—	Michael, G. W., Bakersfield	Wilson	Belgian
2060—	Thompson, Geo. P., Bakersfield	King	Belgian

KINGS COUNTY.

Purebreds.

1528—	Borges, E. R., Lemoore	Seigbert 18694	French Draft
1602—	Lewellyn, Charles, Hanford	Lucumon 92888	Percheron

Mongrels.

646—	Cunningham, Jos., Corcoran	Highland Duke	Mongrel
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LAKE COUNTY.

Purebreds.

1343—	Green, Stephen, Upper Lake	Pronto 106914	Percheron
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Mongrels.

615—	Pluth, Jack, Upper Lake	Prince L	Mongrel
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LASSEN COUNTY.

Purebreds.

1461—	DeForest, Chas. V., Susanville	Carabinier 4979	Belgian
1485—	DeForest, L. E., Susanville	Fernand's Timbre 122866	Percheron
1628—	DeWitt, W. B., and Gibson, B. F., DeWitt	Robin Hood 55077	Percheron
1620—	Hall, A. J., Doyle	Lord Marcus 15381	Clydesdale

LOS ANGELES COUNTY.

Purebreds.

License Number	Name and address of owner	Name of jack
2156—	Baldwin, Anita M., Santa Anita	Belzar 149314 Percheron
2157—	Baldwin, Anita M., Santa Anita	Manzar 149318 Percheron
2158—	Baldwin, Anita M., Santa Anita	Arsar 149315 Percheron
2159—	Baldwin, Anita M., Santa Anita	Minzar 149316 Percheron
2160—	Baldwin, Anita M., Santa Anita	Thazar 149312 Percheron
2161—	Baldwin, Anita M., Santa Anita	Mejus 149317 Percheron
2166—	Baldwin, Anita M., Santa Anita	Mahrutz 364 Arabian
1366—	Baldwin, Anita M., Santa Anita	Ibn Mahruss 22 Arabian
1367—	Baldwin, Anita M., Santa Anita	Althazar 105500 Percheron
1368—	Baldwin, Anita M., Santa Anita	Cruzados 22585 Thoroughbred
1369—	Baldwin, Anita M., Santa Anita	Adalid 69635 Thoroughbred
1370—	Baldwin, Anita M., Santa Anita	Jusque 79515 Percheron
1372—	Baldwin, Anita M., Santa Anita	Cibolo 134 Arabian
1373—	Baldwin, Anita M., Santa Anita	Norito 55925 Thoroughbred
1647—	Bixby, Fred H., Long Beach	Drusus 104782 Percheron
1354—	Carter, Jonathan, Downey	Don Direct 1294 Standard
1355—	Carter, Jonathan, Downey	Neron 6376 Belgian
1362—	Huntington Beach Co., Huntington Beach	Kino 89668 Percheron
1395—	Winter, Chas. W., Alhambra	Alhambra Prince 57367 Standard

Mongrels.

2117—	Morrow, Wm., Downey	King	Mongrel
606—	Rowland, W. R., Puente	Bert	Mongrel

MADERA COUNTY.

Purebreds.

1338—	Tilton, A. H., Madera	Hell 91477	Percheron
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MARIN COUNTY.

Purebreds.

1601—	Bolinas Breeders Association, Bolinas	Occo 4033	German Coach
1613—	Bugeia Bros., Novato	Kenilworth	Thoroughbred
1535—	Pt. Reyes Horsebreeders Association, Pt. Reyes Station	Perfection of Paicines 99322	Percheron

Grades.

473—	Bugeia, L. M., Novato	Royal	Belgian
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MENDOCINO COUNTY.

Purebreds.

1642—	Fausett, T. S., Ukiah	Chiron 100397	Percheron
1393—	Howell, E. D., Ukiah	Anatol 2903	German Coach

Grades.

408—	Bevans, W. S., Potter Valley	Dandy	Shire
429—	Finnish Colony, Calpella	Nick	Percheron
420—	Gschwend, Mrs. Julia, Philo	Mallo II	Shire
447—	Warner, Geo., Willets	Rameur Jr.	Percheron

Mongrels.

632—	Howell, E. D., Ukiah	Tom Dailey	Mongrel
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MERCED COUNTY.

Purebreds.

1561—	Abott, A. N., Merced	Lustridon 33192	Standard
1356—	DeSilva, Joe M., Los Banos	Star 105581	Percheron
1583—	Le Grande Per. Horse Co., Le Grande	Hesiode 121002	Percheron
1538—	Ragsdale, James T., Merced	Hardy 5968	Belgian

Grades.

446—	Newman, Paul, Le Grande	Fred	Percheron
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MODOC COUNTY.

Purebreds.

1636—	Gould, John, Lookout	Modoc Chief 42759	Percheron
1631—	Hanson, Ira, Alturas	Jatinum 90758	Percheron

MONTEREY COUNTY.**Purebreds.**

License Number	Name and address of owner	Name	Breed
1429—	Brinan, Thos., San Ardo	Irun 79322	Percheron
2168—	Jacks, Romie E., Salinas	Johnson's King 5588	Standard
2169—	Jacks, Romie E., Salinas	Launfal 139071	Percheron
1347—	Johnson, H. N., Moss	Bayard 6733	Belgian
1471—	McGrury, John, Salinas	Amoureux 5061	Belgian
1523—	Reinhold, Arnold, Gonzales	Pattern 66554	Percheron
1649—	Stirling, John B., Salinas	Moulton D' Erque 4049	Belgian
1405—	Talbott, Paul, King City	Humorisme 96668	Percheron
1345—	Work, T. A., Monterey	Nailstone Boxer II	Shire

Mongrels.

629—	Bashline, S. T., Salinas	Blondie	Mongrel
652—	Greenlaw, John A., Parkfield	Scottish Chief	Mongrel

NAPA COUNTY.**Purebreds.**

1399—	Bors, J. C., Oakville	Branhope Peel 28133	Shire
1530—	Napa Draft Horse Co., Napa	Mouton 106144	Percheron
1396—	Scally, M., Napa Junction	Boro' Rival 11590	Shire
1598—	Schaeffer, H. S., Pope Valley	Tafta 23494	French Draft

NEVADA COUNTY.**Purebreds.**

1462—	Nevada County Percheron Co., Nevada City	Sir George 53609	Percheron
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ORANGE COUNTY.**Purebreds.**

1435—	Stewart, Geo. W., Santa Ana	Sampson 73481	Percheron
1541—	Thomas, F. M., Santa Ana	Queen's Paul 41275	Percheron

Grades.

411—	Carillo, J. G., El Toro	Trabuca Boy	Percheron
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PLACER COUNTY.**Purebreds.**

1596—	Ganow Bros. and Chas. Ferguson, Auburn	Joseph 99578	Percheron
1385—	Miller, Jacob J., Lincoln	Bennas 12898	French Draft

Grades.

468—	Rogers, I. N., Lincoln	Black Diamond	Percheron
469—	Rogers, I. N., Lincoln	Henry Ford	Percheron

Mongrels.

613—	Blackwell & Hendrickson, Rocklin	Caesar Jr.	Mongrel
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PLUMAS COUNTY.**Purebreds.**

1544—	Laffranchini Bros., Vinton	Castor 46794	Belgian
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RIVERSIDE COUNTY.**Purebreds.**

1607—	Aguiree, J. A., San Jacinto	Keota Charley 35255	Percheron
1292—	Baxter, M. A., Ethanas	Barton 137542	Percheron
2181—	Brunson & Patchin, Corona	Brutus 5961	Belgian
1502—	Brunson & Patchin, Corona	Cesar d' Oisene 3924	Belgian
1339—	Garay, J., Corona	Maheru II 52059	Percheron
1529—	Hall, F. L., Perris	Barnot 89266	Percheron
1634—	Hemet Stock Farm, Hemet	Wilbur Lou 52595	Standard
2190—	Hield, O. C., Armada	Nebraska Chief 4516	Belgian
1578—	Miller-Hight Co., Perris	Garnon 100831	Percheron
2197—	Cantarini, Angelo, Armada	Champion 53055	Percheron

Mongrels.

702—	Densmore, W. H., Hemet	King	Mongrel
675—	Strickland, J. R., Elsinore	Prince	Mongrel

SACRAMENTO COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1337—	Glaser, Earl, Sacramento	Peter Klyo Bell 62389	Standard
1473—	Himebauch, M. E., Walnut Grove	Lohengrin 97267	Percheron
2177—	Lewis, F. J., Sacramento	Laurier 101857	Percheron

Grades.

443—	Barmby, Wm. E., Walsh Station	Jean Bart Jr.	Percheron
407—	Dixon, Wm., Folsom	Bobby	Percheron
413—	Hatch & Comstock, Elk Grove	Prince	Percheron
2057—	Snider, J. R., Antelope	Havana	Percheron

Mongrels.

2132—	Woodruff, S. A., Sacramento	Mike	Mongrel
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SAN BENITO COUNTY.

Purebreds.

1600—	Garcia, Enos, Hollister	Locke Manners 13495	Shire
1489—	Hollister Belgium Horse Co., Hollister	Chaval de la Lys 7695	Belgian
1445—	Reinosa, R. F., Hollister	Hellien 61961	Percheron

Grades.

402—	Indart, John, Tres Pinos	Black Rose II	* * *
439—	Perry, Manuel, Hollister	Percheron	Percheron

Mongrels.

639—	Indart, J. M., Tres Pinos	Nevada	Mongrel
645—	Larios, M. P., Hollister	Ruinart, Jr.	Mongrel
689—	Littlejohn, Wm., Hollister	Tom	Mongrel

SAN BERNARDINO COUNTY.

Purebreds.

1500—	Prendergast, J. J., Redlands	Louset 97578	Percheron
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Mongrels.

657—	Burbank, N. C., Chino	General Kruger	Mongrel
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SAN DIEGO COUNTY.

Purebreds.

1517—	Bradbury, W. N., Escondido	Gordon 72383	Percheron
1511—	Bushnell, Ralph, Mesa Grande	Rhineberry 721163	Thoroughbred
1508—	Stockton, Louis E., Ramona	Aissey 67292	Percheron

Mongrels.

650—	Benton, G. W., Descanso	"K"	Mongrel
614—	Helm, Theofulio, Warner Springs	Jim	Mongrel
625—	Hillkowitz, S., San Diego	Prince	Mongrel
677—	Mills, A. D., San Marcos	Don	Mongrel

SAN FRANCISCO COUNTY.

Purebreds.

1381—	Farnum, Adeline Russella, San Francisco	Marse Abe 50028	Thoroughbred
2183—	Mckee, John & Swen Christensen, S. F.	Imported Warshot 1476	Thoroughbred
1382—	Farnum, Adeline Russella, San Francisco	Dillcara 57462	Standard
2152—	Ratto, John, San Francisco	Labourier 10519	Belgian

SAN JOAQUIN COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1560	Bailey, E. F., Linden	Labourdette 41262	Percheron
1406	Cassidy, P. E. and G. F., Stockton	Governor G. 69409	Percheron
1477	Curran, E., Tracy	Princier 111613	Percheron
1344	Clark, R. L., Lodi	Moru 94920	Percheron
1629	Dolan, Patrick F., Stockton	Capitaine De Goreux	Belgian
1414	Eddleman, A., Acampo	Pilote, Jr. 119373	Percheron
1472	Forman, P. C., Manteca	Mutin 41293	Percheron
1361	Groom, F. A., Stockton	Dexter Derby 55825	Standard
1383	Horan, W. J., Stockton	Sippeo 120653	Percheron
1358	Hughes, I. S., Ripon	Conseil 80169	Percheron
1384	Learned, H. G., Stockton	Bay Boy	Percheron
1608	Linden Horse Co., Linden	California Rex 3435	Thoroughbred
1609	Linden Horse Co., Linden	Ministre 106146	Percheron
1479	Liesy, G. H., Ripon	Imbu 44784	Percheron
1484	Lone Tree Percheron Horse Co., Escalon	Lit 97565	Percheron
1556	Manteca Percheron Association, Manteca	Margio 106634	Percheron
1352	Mast, Geo., Ripon	Rameur	Percheron
1510	Page, W. F., Stockton	Mobilier 106639	Percheron
1515	Prater, Wm. L., Ellsworth	Searchlight 75227	Percheron
1441	Sayles, B. F., Linden	Hero 66636	Percheron
1449	Whitmeier, Simon, Lockeford	Gontran 55938	Percheron
1555	Wildwood Horse Co., Ellsworth	Perseus of Paicines 92761	Percheron

Grades.

448	Chinn, Walter, Manteca	Manteca Boy	Standard
418	Gaul A., Stockton	Inimitable	Percheron
436	Jackson, A. T., Stockton	Royal McKinney	Standard
417	Ohm, John, Vernalis	Black March	Percheron

Mongrels.

636	Garnero, Fred, Stockton	Dan	Mongrel
634	Gatto, Louis, Lathrop	Bill	Mongrel

SAN LUIS OBISPO COUNTY.

Purebreds.

1423	Albright, Charley, San Miguel	Busdubois 61967	Percheron
1470	Bassett, Hamilton & Betty, San Luis Obispo	Chief Guardsman 18756	Clydesdale
1577	Bell, George F., Paso Robles	Grenadier 52274	Percheron
2170	Burbridge, R. M., Adelaide	London Prince 8036	Clydesdale
1407	California Polytechnic School, San Luis Obispo	Pont Nuff 142383	Percheron
1408	California Polytechnic School, San Luis Obispo	Master 122755	Percheron
1403	California Polytechnic School, San Luis Obispo	School Boy 117687	Percheron
1410	California Polytechnic School, San Luis Obispo	Lucien 13130	Percheron
1342	Campbell, S. T., Paso Robles	Pratt 80917	Percheron
1389	Colony Holding Corporation, Atascadero	Director 117686	Percheron
1357	Evans, W. H., Paso Robles	Johesie Mac 50871	Standard
1443	Kneppel, Wm. and Peter, Adelaide	Michel 5622	Belgian
1499	Reis, J. M. and Bells, E. J., Moro	Moka 40732	Percheron
2167	Ryder, R. W., San Luis Obispo	Mona Ansel 61818	Standard

Grades.

409	Claassen, G. J., Paso Robles	Prince	Percheron
435	Madonna, Paul F., Cayucos	Kleberde Second	Belgian
437	Mankins, P. L., Arroyo Grande	Tony	Shire
463	Mankins, Henry, San Luis Obispo	Duke	Shire

SANTA BARBARA COUNTY.

Purebreds.

1497	Bishop, T. B. Co., Goleta	Royal Irwin 16155	Clydesdale
1498	Bishop, T. B. Co., Goleta	Rockwood 11078	Clydesdale
1586	Ferini, J. R., Orcutt	Villain de Bove 5567	Belgian
2175	Martin, Frank V., Orby Station	Superior 97190	Percheron
1583	Silveria, M. P., Santa Maria	Adonis 9717	Belgian
1453	Vear, Frank, Santa Maria	Hamster 70239	Percheron
2192	Hall, N. D., Lompoc	Palo Alto Hero 127600	Percheron
2193	Hoover, B. B., Lompoc	Pride O The Glen 13930	Clydesdale

Grades.

License Number	Name and address of owner	Name	Breed
449—	Carranza, Felix, Sisquoc	King Charm, Jr.	Clydesdale
431—	Craft, J. G., Lompoc	Prince	Percheron
440—	Elvidge, Joseph, Santa Maria	Lods, Jr.	Percheron
2058—	Vaglia, Peter, Orcutt	Sentinal	Percheron
421—	Wineman, Erhart, Santa Maria	King	Shire

SANTA CLARA COUNTY.

Purebreds.

1594—	Coyote Per. Horse Association, San Jose	Bayard 91894	Percheron
2185—	Green, George, Gilroy	Gland 54093	Percheron
1474—	Hall, L. A., Mountain View	Pink Paris 69415	Percheron
1386—	Palo Alto Per. Farm, Stanford University	Ibidem 44767	Percheron
2180—	Palo Alto Per. Farm, Stanford University	Fairhope 136182	Percheron
1468—	Skeels, Harry, Gilroy	Balsa Bill 123931	Standard

Grades.

467—	Blanchard, J. E., San Jose	Diavalo	Standard
434—	Borge, John M., Milpitas	Bill	Belgian
471—	Price, W. N., San Jose	Bob	Belgian
444—	Roose, O. E., Gilroy	Abie	Percheron
445—	Roose, O. E., Gilroy	David	Percheron
460—	Silva & Garcia, San Jose	Bill	Percheron

Mongrels.

637—	Oliver, W. M., Milpitas	Ned	Mongrel
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SANTA CRUZ COUNTY.

Purebreds.

1567—	Mann, Geo. S., Watsonville	Windsuiper 6830	Belgian
1569—	Mann, Geo. S., Watsonville	Maurice 97093	Percheron
1415—	Silliman, G. F., Watsonville	Premier of Paicines 23567	French Draft

SHASTA COUNTY.

Purebreds.

1492—	Mills, Andrew, Anderson	Tryconnel 37909	Thoroughbred
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SIERRA COUNTY.

Grades.

462—	Star Ranch Co., Sattley	Smoke	Belgian
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SISKIYOU COUNTY.

Purebreds.

1611—	Calloway, H. F., Etna Mills	Superior Medium 46957	Standard
1481—	Clemmens, J. R., Dorris	Bruno de Promellas 4184	Belgian
1465—	Fay, Walter, Etna Mills	Marcus 126256	Percheron
4178—	Jesner, Eller & Wagner Bros., Etna Mills	Forban 5085	Belgian
1411—	Lautner, Joseph, Dorris	Ketillac 88602	Percheron
3179—	McCloud River Lumber Co., McCloud	Hispanique 44358	Percheron
1614—	Mitchell, H. W., Mount Dome	Konsensus 88590	Percheron
1341—	Walker & Barnum, Etna Mills	Derfaut de Zweve 3293	Percheron

SOLANO COUNTY.

Purebreds.

1329—	Anderson, Neal, Rio Vista	Bors Wedger II 32019	Shire
1376—	Chandler, F. B. Co., Vacaville	Atherton 22973	French Draft
2172—	Coronado, Jr., Vallejo	Merbrea 19618	Clydesdale
1466—	Ferguson, Wm. M., Dixon	Healani 56150	Standard
2163—	Ferguson, Wm. M., Dixon	Palo Alto Boy 128467	Percheron
1522—	Kernick Bros. and Howe, J. D., Dixon	Havanais 44383	Percheron
1425—	Schielke, H. H. C., Vacaville	Brutus 12207	Percheron
1625—	Westgate, E. W., Rio Vista	Stow Royalty 15396	Shire

Mongrels.

654—	Robben, F. W., Dixon	Blackwood	Mongrel
642—	Schielke, H. H. C., Vacaville	Dandy Junior	Mongrel

SONOMA COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1507	Cazadero Percheron Horse Co., Cazadero	Missipi 107858	Percheron
1346	Fitzpatrick, John, Bodega	Maiseant 106136	Percheron
1565	Harrison, Thos., Santa Rosa	Motif	Percheron
1593	Hinshaw, W. P., Bloomfield	Eugene 68604	Percheron
1565	Jack London Ranch, Glen Ellen	Sonoma Hillside 16842	Shire
1458	Roberts, W. T., Penngrove	Laos 106129	Percheron
1518	Serck, Peter O., Kenwood	Clayton 58683	Percheron

Grades.

428	Exkart, Ed., Cazadero	Bon Coeur, Jr.	Percheron
414	McDonald, Alex., Valley Ford	Garibaldi	Shire
459	Pedroncelli, Frank, Kenwood	George	Belgian
419	Pellascio, Walter, Valleyford	Billy	Shire
412	Von Arx, Victor E., Cazadero	Teddy N.	Percheron

Crossbred.

17	Stefanoni B., Petaluma	Donald Cadet	Shire
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Mongrels.

760	Nufer, T. A., Sonoma	Pollock	Mongrel
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STANISLAUS COUNTY.

Purebreds.

1592	Fernandes, Joe R., Turlock	Cesar d' Hubaume 5954	Belgian
1651	Johnson, Al, Turlock	Bayard de Genly 4328	Belgian
1455	Klenn, W. H., and Hansen, I. C., Newman	Fernando 134484	Percheron
1436	Olds, W. W., Denair	General Metz 127272	Percheron
1359	Proctor, J. W., Hughson	Lentulus 99002	Percheron
1591	Whitmore, Guy C., Ceres	Keota Omer 35246	Percheron
2171	York, Ben, Modesto	Bonnie Edward 15445	Clydesdale

Mongrels.

609	Gish, W. M., Denair	Dolly's Charlie Boy	Mongrel
608	Morgan, Antony, Ceres	Tom	Mongrel
687	Nuney, J. B., Newman	Tom	Mongrel
670	Parker, John, Modesto	Buffalo Dick	Mongrel
717	Ramazzina I., Patterson	Bill	Mongrel
714	Woods, Frank, Newman	Van	Mongrel

Grades.

477	Gillette, C. E., Ceres	Mac	Shire
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SUTTER COUNTY.

Purebreds.

1519	Carpenter, J. C., Yuba City	Figaro de Maeter 5083	Belgian
1516	West Butte Horse Co., Live Oak	Makis 104140	Percheron

Grades.

422	Coffman, G. W. and Daniel, Meridian	Broadaxe	Belgian
432	Michels, F. J., Nicolaus	Prince	Percheron

TEHAMA COUNTY.

Purebreds.

1526	Benjamin, Jas. H., Red Bluff	Master Middleton 16936	Clydesdale
1483	Clark, A. R., Corning	Groom 41264	Percheron
2174	Reed, Walter, Los Molinos	Penn Valley Buster 9809	Belgian
1340	Stone, W. H., Manton	Richard de Bierset 10318	Belgian

TULARE COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1520—	Adams, John J., Dinuba	Louis de Belle Croix 6610	Belgian
1641—	Archer, C. W., Visalia	Themil 43260	Percheron
1475—	Gilmer, T. L. and Thompson, W. M., and Ryan, J. J., Tipton	Majeste 5932	Belgian
1360—	Gist, T. J. & Sons, Tulare	Bruno 101413	Percheron
1612—	Skeeh, T. D., Angiola	Hainvilliers 70242	Percheron
1582—	Stokes, H. J., Visalia	Prince Searchlight 18043	Shire
1546—	Merritt-Bowers Co., Tulare	Stevenot 9260	Belgian
1547—	Merritt-Bowers Co., Tulare	Cadet of Paicines 9241	Belgian
1548—	Merritt-Bowers Co., Tulare	Patre of Paidines 111450	Percheron
1549—	Merritt-Bowers Co., Tulare	Brussell, 9259	Belgian
1550—	Merritt-Bowers Co., Tulare	General Sherman 18042	Shire
1551—	Merritt-Bowers Co., Tulare	Inquiet 69564	Percheron
2173—	Merritt-Bowers Co., Tulare	Raven 5945	German Coach
148—	Williams, Park, Dinuba	Germain 41239	Percheron

Mongrels.

630—	Drois, Chas. M., Waukena	Tom	Mongrel
695—	Dresser Bros., Tulare	Stonewall	Mongrel
633—	Mosier, J. C., Visalia	Ras	Mongrel

TUOLUMNE COUNTY.

Purebreds.

1428—	Childress, O. D., Sonora	Belmont 116157	Percheron
1639—	Zimdars, Waldemar, Columbia	Bouton 42600	Percheron

Mongrels.

643—	Childress, O. D., Sonora	Little Sid	Mongrel
683—	Sharrock, Geo. S., Sonora	Norman Doc	Mongrel
694—	Uhalde, John, Tuolumne	Howdy	Mongrel

VENTURA COUNTY.

Purebreds.

1454—	Hoffman, W. H., Jr., Ventura	George 60034	Percheron
1476—	Kennedy, M. A., Moorpark	Duke 39544	Percheron
1514—	McGrath, D., Estate Co., Oxnard	Roland 123177	Percheron
1427—	Potrero Ranch, Triunfo	Sweidish King 65587	Thoroughbred
1606—	Wallace, C. P., Oxnard	Kersaint 87203	Percheron
1534—	Warren, L. L., Fillmore	Indus Junior 103657	Percheron
2196—	McGrath Estate, Oxnard	Paris 140525	Percheron

Grades.

475—	Willard, Mrs. C. H., Santa Paula	Major	Percheron
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Mongrels.

638—	Dunn, J. J., Piru	Duke	Mongrel
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YOLO COUNTY.

Purebreds.

1590—	Burrows, Fred, Dr., Madison	Gladiateur 5562	Belgian
1635—	Montgomery, J. E., Davis	Jim Logan	Standard
1400—	University of California, Davis	Aiglone 121004	Percheron

Grades.

451—	James, J. E., Esparto	Bobn'r	Belgian
405—	Olsen, C., Woodland	Herald Haarfrage	Percheron
406—	Olsen, C., Woodland	Daniel the Great	Percheron

Mongrels.

2120—	Tominaga, T., Clarksburg	Dexter	Mongrel
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YUBA COUNTY.

Purebreds.

License Number	Name and address of owner	Name	Breed
1448—	Gallagher, A., Wheatland.....	Acteur 65108	Percheron
1404—	Sanders, J. H., Smartsville.....	The Senator 43288	Thoroughbred
1457—	Zbiden, G., Browns Valley.....	Bayard de Mol 4073.....	Belgian

Grades.

465—	McCune, P. W., Marysville.....	M. D. M.....	Standard
425—	Sanders, J. H., Smartsville.....	Sidney Wilkes	Standard
464—	Wood, Joseph, Oregon House.....	Black Diamond	Percheron

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REPORT
OF
CALIFORNIA STATE BUREAU
OF
CRIMINAL IDENTIFICATION
AND INVESTIGATION

FOR THE BIENNIAL PERIOD
ENDING JUNE 30, 1920



CALIFORNIA STATE PRINTING OFFICE
J. M. CREMIN, Superintendent
Sacramento, 1920

THE

NEW YORK STATE ARCHIVES

GENERAL INFORMATION
AND EXPLANATION

OF THE
NEW YORK STATE ARCHIVES



CHAPTER 723.

An act creating a state bureau of criminal identification and investigation, providing for its organization and defining its powers and duties and making an appropriation to carry out the provisions hereof, and repealing an act entitled "An act to create a state bureau of criminal identification, and providing for the appointment of a director of said bureau, defining his duties and qualifications and powers; providing for the appointment of a clerk of said bureau and fixing his qualifications; fixing compensation of said director and clerk, providing for the manner of paying the same and providing for the expense of conducting the office," approved March 20, 1905.

(Approved May 31, 1917; Statutes 1917, page 1391.)

The people of the State of California do enact as follows:

SECTION 1. There is hereby created a state bureau of criminal identification and investigation.

SEC. 2. Within ten days after this act goes into effect, it will be the duty of the governor to appoint a board of managers of said bureau, consisting of three members: one of whom shall be a chief of police of an incorporated city within the State of California, and one to be a duly elected, qualified and acting sheriff of a county within said state, and one to be a duly elected, qualified and acting district attorney of a county within said state; one member of said board shall be appointed to hold office for the term of two years, one member shall be appointed to hold office for the term of three years, and one member to be appointed to hold office for the term of four years, and thereafter, all appointments shall be for the full term of four years; *provided, however*, that should the term of any such member of said board expire as such chief of police, or such sheriff, or such district attorney, he shall cease to be a member of the said board; *and provided, further*, that the governor shall fill all vacancies created in said board by the appointment of the same kind of an officer as was his predecessor.

SEC. 3. It shall be the duty of said board of managers within ten days after its appointment to take absolute control and management of said bureau, to meet and organize by choosing one of their number to be president, to make and adopt such rules as are necessary for proper conduct of their business as such board of managers, to provide for the appointment of a superintendent and such other employees as may be required; said appointments to be made by the said board of managers from an eligible list provided for such purpose by the civil service commission; also to provide equipment for said bureau, with necessary furniture, fixtures, apparatus, appurtenances, appliances and materials as are necessary for the collection, filing and preservation of all criminal records both as to identification and investigation of criminals, and stolen, lost, found, pledged or pawned property.

SEC. 4. It shall be the duty of said board of managers to procure and file for record and report in their office, as far as such can be procured, all plates, photos, outline pictures, descriptions, information and

measurements of all persons who have been or shall hereafter be convicted of felony, or imprisoned for violating any of the military, naval, or criminal laws of the United States of America, and of all well-known and habitual criminals from wherever procurable.

SEC. 5. It shall be the duty of said board of managers to file or cause to be filed all plates, photographs, outline pictures, measurements, information and description which shall be received by it by virtue of its office and it shall make a complete and systematic record and index of the same, providing thereby a method of convenience, consultation and comparison. It shall be the duty of said board of managers to furnish, upon application, all information pertaining to the identification of any person, or persons, a plate, photograph, outline picture, description, measurement, or any data of which person there is a record in its office. Such information shall be furnished to the United States officers or officers of other states or territories, or possession of the United States or peace officers of other countries duly authorized to receive the same, and all peace officers of the State of California, which application shall be in writing and accompanied by a certificate signed by the officer making such application, stating that the information applied for is necessary in the interest of the due administration of the laws, and not for the purpose of assisting a private citizen in carrying on his personal interests or in maliciously, or uselessly, harassing, degrading or humiliating any person or persons.

SEC. 6. In this bureau may be used the following systems of identification: the Bertillon, the finger print system and any system of measurement that may be adopted by law in the various penal institutions of the state. It shall be the duty of said board of managers to keep on file in its office a record consisting of duplicates of all measurements, processes, operations, signalletic cards, plates, photographs, outline pictures, measurements and descriptions of all persons confined in penal institutions of this state as far as possible, in accordance with whatever system or systems may be in vogue in this state.

SEC. 7. Suitable offices for the proper conduct of the bureau shall be provided for by the superintendent of capitol buildings and grounds.

SEC. 8. It is hereby made the duty of the sheriffs of the several counties of the State of California, the chiefs of police of incorporated cities therein and marshals of incorporated cities and towns therein to furnish to the said bureau daily copies of finger prints on standardized eight by eight inch cards, and descriptions of all such persons arrested who in the best judgment of such sheriffs, chiefs of police, or city marshals are persons wanted for serious crimes, or are fugitives from justice, or of all such persons in whose possession at the time of arrest are found goods or property reasonably believed by such sheriffs, chiefs of police or city marshals to have been stolen by them; or of all such persons in whose possession are found burglar outfits or burglar tools or burglar keys or who have in their possession high power explosives reasonably believed to be used for unlawful purposes or who are in possession of infernal machines, bombs or other contrivances in whole or in part and reasonably believed by said sheriffs, chiefs of police and city marshals to be used for unlawful purposes, or of all persons who carry concealed firearms or other deadly weapons and reasonably believed to be carried for unlawful purposes, or who have in their possession inks, dye, paper or other articles necessary in the making of

counterfeit bank notes, or in the alteration of bank notes; or dies, molds or other articles necessary in the making of counterfeit money, and reasonably believed to be used by them for such unlawful purposes. This section is by no means intended to include violators of city or county ordinances or of persons arrested for other trifling offenses. It is further made the duty of the aforesaid sheriffs, chiefs of police or city marshals to furnish said bureau daily reports of lost, stolen, found, pledged or pawned property received into their respective offices.

SEC. 9. In order to assist in the recovery of said property and in the arrest and prosecution of criminals, it is hereby made the duty of the said board of managers of said bureau to keep a complete record of all reports filed with the said bureau, of all personal property stolen, lost, found, pledged, or pawned in any city or county of this state.

SEC. 10. To provide for the installation of a proper system, and file, and cause to be filed therein cards containing an outline of the method of operation employed by criminals in the commission of crime.

SEC. 11. The board of managers of this bureau shall serve without compensation; *provided, however*, that they shall receive their necessary traveling expenses while attending meetings of said board. The superintendent shall receive a salary of two thousand four hundred dollars per annum; the salaries of the other employees shall be fixed by the board of managers, subject to the approval of the board of control. The superintendent and the other employees shall be paid in the same manner and out of the same fund as the state officers are paid.

SEC. 12. There is hereby appropriated out of any money in the state treasury, not otherwise appropriated, the sum of thirty-six thousand dollars, or so much thereof as may be necessary, to be used by said board of managers in furnishing, equipping and maintaining the said bureau in accordance with the provisions of this act, and for the payment of the salaries herein provided for, for the fiscal year ending June thirtieth, one thousand nine hundred eighteen, and the fiscal year ending June thirtieth, one thousand nine hundred nineteen.

SEC. 13. The state controller is hereby directed to draw warrants in favor of the said board of managers at such times and such amounts as shall be approved by the state board of control, and the state treasurer is hereby directed to pay the same.

SEC. 14. All furniture, equipment and records now on file and in use in the office of the "bureau of criminal identification of the State of California," shall become a part of the furniture, equipment and records of the "state bureau of criminal identification and investigation," immediately upon the organization of the board of managers as provided for in this act.

SEC. 15. An act entitled, "An act to create a state bureau of criminal identification, and providing for the appointment of a director of said bureau, defining his duties and qualifications and powers; providing for the appointment of a clerk of said bureau and fixing his qualifications; fixing compensation of said director and clerk, providing for the manner of paying the same and providing for the expense of conducting the office"; approved March 20, 1905, is hereby repealed and all other acts and parts of acts in conflict herewith are hereby repealed.

LETTER OF TRANSMITTAL.

EX-107-100 July 1, 1920.

To His Excellency,

WILLIAM D. STEPHENS, *Governor,*
Sacramento, California.

SIR: We have the honor to transmit to you the biennial report of the superintendent of the Bureau of Criminal Identification and Investigation for the period ending June 30, 1920.

It will be seen from a perusal of the superintendent's report and the statistical tables attached thereto, that the bureau is rendering valuable service to the state, by furnishing to the peace officers of the several counties and municipalities therein information leading to the rapid apprehension and identification of delinquents, and to the recovery and restoration to lawful owners thereof, stolen property valued at nearly one million dollars.

While justifiably proud of the bureau's achievements since its inception, we are of the opinion that the activities of the bureau should be extended to include: (a) the collection of information, reports, and data of and concerning complaints of crimes committed, or suspected to have been committed, in this state, such data relating to such crimes to comprise the history of the case and all legal steps taken in connection therewith and all proceedings ancillary thereto from the inception of the complaint to the discharge of the defendant, either upon hearing or upon expiration of term of sentence; (b) the collection of information concerning the cost of crime to the people of California, such information to include expenditures for salaries of officials and maintenance of institutions of all kinds dealing with crimes and criminals, also losses to individuals by theft or damage through criminal acts or by criminals; (c) the collection of data regarding the causes of crime. A scientific inquiry into this subject should not be longer delayed, in view of the fact that it has been estimated that crime costs the state of California thirty-six millions of dollars annually, and despite the many recently established institutions, including juvenile courts and juvenile detention homes, probation and parole departments, newer methods of dealing with delinquents in and out of institutions,

it is a deplorable fact, but nevertheless true, that there appears to be no diminution in offenses committed and reported to peace officers annually; (d) a laboratory for the chemical and microscopical examination of material sent to the bureau by peace officers, which may be helpful to them in the solution of crimes or used as evidence in trials, and to render to such officers a report of the findings of such experts as will be employed to conduct said laboratory.

Recommendations regarding salary increases for the clerical force in the bureau are fully indorsed and in addition we recommend that the compensation of the superintendent be increased to \$3,600 per annum.

Respectfully yours,

RAY MANWELL,
AUGUST VOLLMER,
JNO. C. CLINE,

*Board of Managers, State Bureau of
Criminal Identification and Investigation.*

REPORT OF THE BUREAU OF CRIMINAL IDENTIFICATION AND INVESTIGATION.

The Honorable Board of Managers,

*Bureau of Criminal Identification and Investigation,
Sacramento, California.*

GENTLEMEN: I have the honor to submit herewith a report of the work of the bureau for the biennium period ending June 30, 1920, also recommendations which will promote further efficiency.

In return for an investment of \$35,000, for the maintenance of the bureau during the past two years, the citizens and taxpayers have received an exceedingly large dividend, which is shown by the fact that lost and stolen property to the value of \$703,037.50 has been returned to them through information furnished by the bureau.

Twenty-five hundred and fifty law violators, whose finger prints and descriptions were received, were identified by the bureau as having prior criminal records which were unknown to the arresting department. Taking into consideration the fact that over fifty per cent of the criminals, when guilty of the crime accused, will, upon being shown proof of their prior convictions, enter a plea of guilty, thus eliminating the expense of a jury trial costing approximately \$500 each, there was an additional saving to the taxpayers of \$637,500. This has been effected through the direct aid of the bureau.

In addition to the above relatives the bureau has a deterrent effect upon evildoers, for it is a well-established axiom that habitual criminals shun localities where efficient bureaus of identification are maintained.

Cooperation of peace officials in making the necessary reports of crimes committed, persons wanted or arrested and property stolen or pawned, in connection with the proficiency of the clerical force in compiling such reports received, has permitted the upbuilding of just such a bureau, for with the systems maintained therein the identity of many principals in crime is established, together with the recovery of stolen property, as for example: The Modus Operandi System connects the culprit with the crime through the peculiar individual method employed in committing a particular offense; the latent finger prints of the perpetrator left at the scene of the crime, when found to correspond with finger-print records on file, establish a positive identification; the signature upon the finger-print card of the arrested check operator, after careful examination by the handwriting expert, provides another important means of identifying the fraudulent check

artist: the personal description recorded by the pawnbroker of the thief who sells or pledges the stolen loot offers another clue to identity.

By a system of cross-indexing the reports and methods as explained above, a final cumulative report is obtained whereby peace officials are furnished definite and reliable information which not only assists in the apprehension of criminals, but is a most important factor in the suppression of crime.

To efficiently compile such data it is necessary to have the services of persons thoroughly qualified and experienced in this scientific work and in order to secure and retain such experts it is absolutely essential that they be adequately compensated.

Therefore, I recommend that the salaries of the identification and handwriting experts be increased to \$250 per month; the finger-print clerks to \$150 per month; and that two additional typists be added to the clerical force at a salary of \$100 per month.

The increase in price of material, supplies and equipment essential to continuing the activities of the bureau, together with the allowance that must be made for the increase in volume of business and the proposed salary advance, will necessitate an appropriation of \$60,000, or so much thereof as is necessary to properly conduct the bureau for the coming biennial period.

I desire to thank the board of managers of the bureau, the executive officials of the state, and the peace officers, wardens, and identification operators of the United States and Canada for their kind advice and cooperation.

Their splendid support has materially aided in the successful upbuilding of the State Bureau of Criminal Identification and Investigation.

Respectfully submitted.

C. S. MORRILL,
Superintendent.

APPENDIX.

SUMMARY.

Number of articles pawned or sold recorded and filed.....	279,701
Number of articles stolen or embezzled recorded and filed.....	19,568
Number of lost, stolen or embezzled articles identified.....	1,163
Value of lost, stolen or embezzled articles identified.....	\$703,037 50
Number of anatomical index cards filed.....	2,160
Number of Bertillon records filed.....	332
Number of circulars of persons wanted, received.....	2,722
Number of criminal index cards filed.....	64,517
Number of criminal photos received and filed.....	31,552
Number of finger prints received.....	33,686
Number of geographical index cards filed.....	980
Number of individual records of important cases filed.....	547
Number of modus operandi cards filed.....	439
Number of recidivists' individual records filed.....	5,401
Number of identifications and verifications, criminal.....	5,106
Appropriation, 1918-1919 and 1919-1920.....	\$37,187 23
Expenditures	34,957 34
Balance of appropriation on hand.....	\$2,229 89

Grand Totals of Records on File.

Circulars on file July 1, 1918.....	1,246
Circulars filed from July 1, 1918, to June 30, 1919.....	1,554
Circulars filed from July 1, 1919, to June 30, 1920.....	1,709
Total circulars on file June 30, 1920.....	4,509
Criminal index cards on file July 1, 1918.....	14,420
Criminal index cards filed from July 1, 1918, to June 30, 1919.....	35,168
Criminal index cards filed from July 1, 1919, to June 30, 1920.....	29,349
Total criminal index cards on file June 30, 1920.....	78,937
Finger prints on file July 1, 1918.....	9,569
Finger prints filed from July 1, 1918, to June 30, 1919.....	13,761
Finger prints filed from July 1, 1919, to June 30, 1920.....	13,833
Total finger prints on file June 30, 1920.....	37,163
Recidivists' individual record cards on file January 1, 1920.....	3,534
Recidivists' individual record cards filed from January 1, 1920, to June 30, 1920.....	1,867
Total Recidivists' individual record cards on file June 30, 1920.....	5,401
Individual records of important cases on file January 1, 1920.....	498
Individual records of important cases filed from January 1, 1920, to June 30, 1920.....	49
Total individual records of important cases on file June 30, 1920.....	547
Modus operandi cards on file June 30, 1920.....	439
Pawned articles on file July 1, 1918.....	63,986
Pawned articles filed from July 1, 1918, to June 30, 1919.....	149,387
Pawned articles filed from July 1, 1919, to June 30, 1920.....	130,314
Total pawned articles on file June 30, 1920.....	343,687
Lost, stolen or embezzled articles on file July 1, 1918.....	10,803
Lost, stolen or embezzled articles filed from July 1, 1918, to June 30, 1919.....	9,843
Lost, stolen or embezzled articles filed from July 1, 1919, to June 30, 1920.....	9,725
Total lost, stolen or embezzled articles on file June 30, 1920.....	30,371

Grand Totals of Identifications Made.

Articles identified prior to July 1, 1918.....	137
Articles identified from July 1, 1918, to June 30, 1919.....	288
Articles identified from July 1, 1919, to June 30, 1920.....	875
Total articles identified June 30, 1920.....	1,300
Finger print records verified from July 1, 1918, to June 30, 1919.....	2,004
Finger print records verified from July 1, 1919, to June 30, 1920.....	3,483
Total finger print records verified June 30, 1920.....	5,492
Identifications of criminals prior to July 1, 1918.....	237
Identifications of criminals from July 1, 1918, to June 30, 1919.....	695
Identifications of criminals from July 1, 1919, to June 30, 1920.....	1,618
Total identifications of criminals June 30, 1920.....	2,550
Identifications for California departments prior to July 1, 1918.....	233
Identifications for California departments from July 1, 1918, to June 30, 1919.....	610
Identifications for California departments from July 1, 1919, to June 30, 1920.....	1,325
Total identifications for California departments June 30, 1920.....	2,168
Identifications for foreign departments prior to July 1, 1918.....	4
Identifications for foreign departments from July 1, 1918, to June 30, 1919.....	85
Identifications for foreign departments from July 1, 1919, to June 30, 1920.....	293
Total identifications for foreign departments June 30, 1920.....	382

Records Received and Discarded for Fiscal Years 1918-1919 and 1919-1920.

	Circulars received		Circulars discarded		Finger prints received		Finger prints discarded		Photos received	
	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920
California cities—										
Alameda	3	1			38	27	3	6	33	19
Bakersfield	9	37	3	7	189	196	24	42	271	152
Berkeley	21	45	3	14	189	235	55	13	106	104
Chico	7	11	1	1	4	1	1			
Eureka		1			21	16	2	6		
Fresno	2				1					
Healdsburg					2					
Long Beach	5	12	1	5	224	257	18	27	434	507
Los Angeles	197	424	11	50	832	1168	277	427	1473	2126
Marysville	1	1		1	24	38	12	20		
Oakland	163	219	30	43	1481	819	165	163	870	918
Oroville					2					
Pasadena		6		1	22	174	7	54	22	165
Petaluma	2									
Piedmont		1				9		2		2
Pomona					1	1				
Redwood City		2								
Richmond	1	8			89	83	5	9	103	143
Riverside	2	1						2		
Sacramento	6	6	1	1	504	473	132	105	681	384
San Diego	5	5			411	433	48	61	674	804
San Francisco	826	774	48	82	1458	1139	116	168	2652	2001
San Jose		2			173	192	18	39	276	384
Santa Barbara	2	6	1	2	78	83	13	18	126	143
Santa Maria		3		2	81	2	13	4		
Santa Monica		1			77	32	23	13	73	33
Stockton					24		1		20	
Upland	1									
Vallejo	10		2		40	58	6	7	30	52
Weed						10		2		
Totals	1269	1569	101	209	5965	5446	939	1193	7844	7937

Records Received and Discarded—Continued.

	Circulars received		Circulars discarded		Finger prints received		Finger prints discarded		Photos received	
	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920
California counties—										
Alameda						35		13		2
Amador					2		2			
Butte	2	3			3	10	2	5		
Calaveras					12	7	8	6		
Colusa	1	3			21	12	5	7	2	
Contra Costa	12	6	1		49	32	14	9	5	6
Del Norte	1				1					
El Dorado					1		1			
Fresno	11	39		9	344	319	26	38	341	318
Glenn	1	2		1		7		4		
Humboldt	1	1			7	1	4			
Imperial					22	39	4	21	15	36
Inyo					3	2				
Kern	4						1			
Kings					21	35	8	6	13	33
Lassen		1		7						20
Los Angeles					1393	1292	139	189	1254	1299
Madera		3		1	42	39	16	11	5	
Marin					2	17	1	4		
Mendocino	1		1		62	60	2	8		
Mered	2	2	1		31	31	8	7	15	10
Monterey					16	10	9	4		
Napa	1									
Nevada					8	8		1		
Orange	13	26	1	6	236	266	21	23	326	444
Placer	6			1	23	52	6	14	10	3
Plumas	1				16	23	4	5		
Riverside	6	13		2	41	52	8	11	21	
Sacramento	2	3		2	1	36	4	13		
San Bernardino	21	29	4	2	197	429	31	55	175	426
San Diego		1			71	45	2	5	72	56
San Joaquin	6	5	2		251	212	34	56	160	265
San Luis Obispo		1		1	4	5	2	2	4	1
San Mateo	4	2	1		28	50	9	17		
Santa Barbara							1			
Santa Clara	9	4	1	1	94	191	36	95	59	114
Santa Cruz					50	39	16	14	24	20
Shasta	2	2			8	20	1	4	1	
Siskiyou					5	45	1	8		
Solano		1			8	1		1		
Sonoma		1	1	1	33	60	7	6	32	58
Stanislaus						20		12		15
Sutter		3				2		12		
Tehama	4									
Trinity					2		1			
Tulare	1	6		4	19	149	5	11	50	276
Ventura	2	2	1			48		7		78
Yolo	2				13	6	2	1	4	
Yuba	7	2	1	2	60	48	22	13	95	94
Totals	122	161	15	33	3203	3715	463	713	2688	3458

Records Received and Discarded—Concluded.

	Circulars received		Circulars discarded		Finger prints received		Finger prints discarded		Photos received	
	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920	1918 1919	1919 1920
California prisons—										
Folsom		1			447	386	235	344	259	350
San Quentin		1	1	1	1134	1187	552	983	1693	1635
Totals		2	1	1	1581	1583	787	1327	1952	1985
Foreign—										
Beaumont, Texas					137	222		11	137	127
Butte, Mont.		1				23		1		
Cochise County, Ariz.						4		1		1
Colorado Springs		1		1	124	51	3	5	122	51
Dallas, Texas	1				53	73	2	5	52	72
Denver, Colo.		4			167	156	8	11	2	2
Detective, The					1					
Elko, Nev.					28	145	11	17		
Everett, Wash.			66		66		1		67	
Great Falls, Mont.		1				32				30
Houston, Texas		2		1	265	256	20	11	249	251
Illinois Penitentiary	1	4		1	64	608		11	3	1
Jefferson City, Mo.					13					
Kansas City, Mo.		1			208	3	13			
Kansas Penitentiary		1			28	5	5	4	1	
Massachusetts Pen. and Ref.	1	3			819	1000	15	118	8	6
Michigan Penitentiary	2	1			96	37	1	1	20	
Miscellaneous departments	224	202	7	10	336	586	23	30	55	70
Montana Penitentiary	10			4	261	201		4	243	197
Nevada Penitentiary	5				80	44	5	14	72	41
New Orleans, La.						65		7		65
Ohio State Bureau		4				41		2		7
Ohio Reformatory	99				170				46	
Oklahoma Penitentiary		2		3	436	972	2	34		
Omaha, Neb.		1			510	509	8	20	403	500
Oregon Penitentiary	3			1	103	184	5	19	110	174
Phoenix, Ariz.						5				5
Reno, Nev.	2	2		1	83	13	13	4	161	25
Salt Lake City, Utah		1		1	9	80	3	15	5	78
Seattle, Wash.	5	5	1	1	461	642	20	44	419	636
Spokane, Wash.		1			257	144	3	15		
St. Joseph, Mo.	1	2			213	171	3	8	170	137
St. Louis, Mo.		1				92		2		45
Tacoma, Wash.		1			194	218	29	42	163	214
Washington Penitentiary		4		1	4	19		9		
Wichita, Kans.					216	189	6	3	203	188
Totals	354	245	74	25	5403	6790	202	468	2716	2932

Modus Operandi Records Filed, 1919-1920.

Burglary modus operandi records	254
Checks modus operandi records	101
Larceny modus operandi records	55
Robbery modus operandi records	29
Total modus operandi records	439

[illegible]

Records Received and Filed for the Fiscal Years 1918-1919 and 1919-1920—Articles Stolen—Continued.

	Automobiles			Bicycles			Firearms			Miscellaneous			Silverware			Motorcycles			Watches			Totals		
	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920
California cities—continued.—																								
Santa Rosa	1																					1		
Selma		1																						
South Pasadena																								
Stockton	36	23		73	76		4	8		6	2													
Vallejo	6	3		1	6		16	18		53	20													
Venice																								
Victorville		2																						
Visalia		1									2													
Watts		5																						
Westwood		1									1													
Willows																								
Winters	2	3																						
Woodland		1									1													
Yuba City																								
Totals	1,377	1,867		892	369		386	308		1,629	1,418		115	127		70	161	2,619	1,721			7,388	6,201	

Records Received and Filed for the Fiscal Years 1918-1919 and 1919-1920—Articles Stolen—Continued.

	Automobiles			Bicycles			Firearms			Miscellaneous			Motorcycles			Silverware			Watches			Totals		
	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920
California counties—																								
Alameda																						2		
Amador																						1		
Butte		1	2																			1	1	
Colusa		1																				1	3	
Contra Costa		1																				1	1	
Glenn		5																				2	6	4
Humboldt																								
Kings																								
Los Angeles																								
Madera		56	133																			56	187	
Marin		1	2																			1	2	
Merced																								
Monterey																								
Nevada		1																						
Orange																								
Placer																								
Plumas		2																						
Riverside		1	4																					
Sacramento		5	6																					
San Bernardino		1	4																					
San Diego		1	1																					
San Joaquin		1	1																					
San Luis Obispo		8																						
San Mateo																								
Santa Clara		18	8		1																			
Santa Cruz			1																					
Shasta		3																						
Sonoma																								
Stanislaus		2																						
Sutter		1	1																					
Tulare		1	9																					
Tuolumne																								
Ventura		1																						
Yuba		3																						
Totals	112	241		3	1		2	4		12	41		5	11		2	10		18	18		154	326	

Records Received and Filed for the Fiscal Years 1918-1919 and 1919-1920—Articles Stolen—Concluded.

	Automobiles			Bicycles			Firearms			Miscellaneous			Motorcycles			Silverware			Watches			Totals		
	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920
Foreign—																								
London and Lancashire		12																						12
Foreign departments	181	125			5			2	23		254	32		8			14	5		113	81	569	272	
P. C. A. U.	930	1,831												5	10							944	1,841	
Portland	61	127						2		34	44			6		1	14		75	158	179	343		
Reno	5							5	15	18	3								7	16	39	34		
Salt Lake City	12									3												15		
San Scott		14																					14	
Seattle	98	132	39	61	21	45	139	91					23	3	8		191	297	495	657			22	
Southern California A. C.		18			4																			
Spokane	6	1						3		5				3					32	49	1		2	
Tacoma		2																				2		
Vancouver																								
Totals	1,304	2,362	45	70	33	83	453	170					21	34	18	27	418	552	2,292	3,193				

Records Received and Filed for the Fiscal Years 1918-1919 and 1919-1920—Articles Pawned.

	Automobiles			Bicycles			Firearms			Miscellaneous			Motorcycles			Silverware			Watches			Total		
	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920	1918	1919	1920
California cities—																								
Alameda	8	4		13	11		168			11	36		31	5					622	565		1		3
Bakersfield				12	32		13			13			12						18	39			856	774
Berkeley		24		1	1		309			143	161								2,439	2,598			56	134
Fresno	21			65	7		67			22	13								388	92			2,883	3,243
Long Beach				196	87		4,127			3,887	2,506		172						31,212	28,115			513	148
Los Angeles	4,057	3,206			5						1		23										43,680	38,515
Marysville		1																	25	14			30	19
Modesto																								
Oakland	6	52		22	17		478				1													1
Pasadena							1,576			718	1,343		2	5					7,450	12,067			8,683	15,359
Sacramento	52	22		7	113		819				1													23
San Diego	745	914		50	25		773			422	375		6	14					6,802	7,776			8,070	9,111
San Francisco	114	10		26	8		828			1,613	1,613		2	22					6,112	7,813			8,742	11,420
San Jose				1	1		3,654			8,094	2,944		3						32,438	34,018			64,485	39,438
Santa Ana							86			33	5								443	211			563	253
Santa Ana	3	1		70	35		1,470			208	108		6	0										1
Stockton				9	2		163			558	492								5,850	6,552			7,408	8,137
Vallejo	1																		1,417	1,465			1,948	2,275
Totals	5,007	4,235		475	340		12,141			14,272	9,799		67	232					115,156	101,503			148,967	128,858
California counties—																								
Yuba							14												52				66	
Foreign—																								
Reno, Nevada	1	4		1	18		359			83	67		1						810	902			1,254	1,456

Statement of Expenditures for the Fiscal Years 1918-1919 and 1919-1920.

Functions	Materials and Supplies		Salaries and Wages		Service and Expense		Property and Equipment		Totals	
	1918	1919	1918	1919	1918	1919	1918	1919	1918	1919
Board of managers and superintendent.....			\$2,400 00	\$2,400 00	\$221 25	\$313 38			\$2,621 25	\$2,713 38
Clerical and office.....			8 719 79	16,970 63	1,157 60	1,477 52	\$2,708 98	\$120 40	14,158 89	12,697 88
Photographic.....	\$1,572 52	\$129 30			4 50		377 55		428 11	79 12
Freight, cartage and express.....	46 03	79 12							67 49	30 78
Janitor.....			\$22 43	366 00	67 49	30 78			358 35	341 55
Light, heat and water.....	15 42	13 80			55 12	68 38	19 50		151 91	228 82
Postage.....	84 36	112 25					12 43	.48 19	165 00	170 00
Printing.....					165 00	170 00			233 60	171 94
Telephone and telegraph.....					233 60	171 94			152 63	156 64
Totals.....	\$1,718 33	\$834 47	\$11,443 22	\$13,670 66	\$2,057 19	\$2,446 39	\$3,118 40	\$168 59	\$18,337 23	\$16,620 11

Total expenditures, 1918-1919 and 1919-1920, \$34,657 34.

**Crime, Race and Sex of California Arrests for Fiscal Years 1918-1919 and
1919-1920.**

	1918 1919	1919 1920
Crime—		
Abandonment	242	158
Abduction	3	17
Abortion	2	5
Adultery	12	33
Alien enemy	115	1
Arson	19	19
Assault	374	338
Bigamy	20	15
Bribery	7	5
Burglary, first degree	1,087	1,587
Burglary, second degree	11	7
Counterfeiting	9	10
Contributing	43	64
Crime vs. nature	15	10
Cummingius	1	
Disturbing peace	133	76
Draft evader	72	
Embezzlement	219	159
Escape	12	20
Extortion	8	7
False impersonation	2	5
False pretense	72	89
Felony	304	322
Fellatio	8	
Forgery	393	251
Fictitious	155	302
Fraudulent		1
Fugitive		6
Incest	6	11
Indecent exposure	11	16
Innkeeper, defrauding	12	17
I. W. W.	48	136
Juvenile, delinquent	8	7
Larceny, grand	1,008	1,121
Larceny, animal	6	4
Larceny, automobile	212	306
Larceny, confidence	21	35
Larceny, pickpocket	19	23
Larceny, petit	799	791
Lascivious conduct	116	119
Mayhem	3	6
Murder	192	184
Narcotics	100	157
Obscene		2
Parole violator	32	10
Rape	240	269
Receiving stolen property	51	87
Robbery	590	487
Robbery, bank	5	6
Seduction	11	5
Sodomy	17	11
Threatened offense	15	16
U. S. laws	171	123
Vagrancy	1,199	1,681
Totals	8,285	9,161

**Crime, Race and Sex of California Arrests for Fiscal Years 1918-1919 and
1919-1920—Concluded.**

	1918 1919	1919 1920
Race—		
Caucasian	6,683	7,530
Ethiopian	387	446
Indian or Mexican	1,082	1,016
Malay	34	88
Mongolian	90	81
Totals	8,285	9,161
Sex—		
Female	299	292
Male	7,986	8,869
Totals	8,285	9,161

Records Filed and Discarded By the Month.

	Finger prints Received	Finger prints Discarded	Circulars Received	Circulars Discarded	Photos Received	Articles stolen and embezzled	Articles pawmed
1918-1919							
July	1,304	226	114	6		408	12,990
August	1,064	171	125	15	906	603	12,254
September	944	122	87	10	950	516	11,278
October	1,196	190	167	14	1,158	1,063	12,226
November	1,232	142	71	10	1,239	835	11,630
December	1,095	155	58	63	1,195	771	11,485
January	1,282	114	150	10	1,718	543	16,880
February	966	177	154	9	1,236	677	13,401
March	1,218	208	75	14	1,764	1,623	15,598
April	1,381	196	286	16	1,559	1,221	15,053
May	743	374	70	15	1,015	677	7,585
June	1,353	336	227	10	1,876	841	8,998
Totals	13,761	2,391	1,554	191	14,610	9,843	149,387
1919-1920							
July	940	352	88	32	928	930	6,624
August	1,246	223	153	18	1,177	744	4,130
September	1,490	338	214	22	1,389	970	13,409
October	1,942	278	141	15	1,341	838	12,544
November	1,600	289	202	16	1,111	848	10,392
December	1,566	294	194	22	1,513	740	17,048
January	1,649	315	188	21	1,373	897	15,430
February	1,269	308	209	36	1,413	684	4,405
March	1,505	274	148	25	1,569	938	11,043
April	1,613	350	134	17	1,649	569	17,208
May	1,237	279	156	23	1,112	664	9,389
June	1,468	301	150	21	1,377	963	8,692
Totals	17,534	3,701	1,977	268	16,352	9,725	130,314

Identifications.

1918-1919	Latent prints.	Moldus operandi.	Handwriting.	Alphabetical.	Finger prints.	Recognition.	Totals.
July					26	2	28
August					37	4	41
September					31		31
October				2	62	2	66
November				3	53		56
December				3	33		36
January				6	63	1	60
February				7	57	1	65
March				4	69		70
April				2	53	3	50
May			1	3	57		91
June				6	77		63
Totals			1	37	645	12	615
1919-1920							
July				5	76	1	82
August				11	61		72
September				9	67		76
October				9	102	2	113
November				11	88	1	100
December				6	133	1	145
January				10	178	1	189
February				9	159	1	169
March			1	8	152	1	162
April				2	172		174
May		1		17	141	1	169
June	2			7	167		176
Totals	2	1	1	104	1,501	9	1,618

Finger Prints Verified.

	1918 1919	1919 1920
July	198	462
August	130	417
September	91	353
October	156	382
November	150	238
December	131	282
January	90	233
February	134	291
March	195	255
April	139	212
May	313	151
June	277	212
Totals	2,004	3,488

Identifications for California and Foreign Departments.

	California Departments		Foreign Departments	
	1918 1919	1919 1920	1918 1919	1919 1920
July	24	75	4	7
August	35	60	6	12
September	24	65	7	10
October	60	84	6	29
November	50	63	6	37
December	27	131	9	14
January	68	168	1	21
February	58	149	7	20
March	60	127	10	35
April	51	122	8	52
May	80	140	11	20
June	73	140	10	36
Totals	610	1,325	85	293

Articles Identified.

	July	August	September	October	November	December	January	February	March	April	May	June	Totals
1918-1919													
Automobiles	5	11	4	4	2	3	6	17	14	17	22	31	136
Bicycles						1	1	2		1		2	14
Firearms	2	1	2					2					2
Miscellaneous	1	3					4	2	9			2	21
Motorcycles					1			2	3	2	2	2	12
Silverware		1											1
Watches	4	11	3	4	3	7	12	18	11	11	8	12	104
Totals	12	27	9	8	7	11	24	41	37	31	32	49	288
1919-1920													
Automobiles	20	21	22	32	28	19	19	9	258	18	22	73	551
Bicycles	1				1						1		3
Firearms	2		2	7		4	3		1	2	3	1	25
Miscellaneous	3	1	1	2	3	8	7	2	2	10	3	2	44
Motorcycles	4	1	2		4	1	3		3	3	1	1	23
Silverware						1					2		4
Watches	17	12	6	24	16	36	23	8	16	34	18	15	225
Totals	56	35	33	65	52	69	55	19	281	67	51	92	875

Forms in use by sheriffs' offices and police departments in furnishing information to the bureau regarding the Modus Operandi employed by the habitual criminal in the commission of a particular crime. All such reports received are indexed under the Findex System.

BURGLARY.

Name.

Date.

No.

External Examination.

- | | |
|--|---|
| 1. How was the house (or premises) approached? | 7. What articles were used to reach the point? |
| 2. Any trace of same? | 8. If none, was it reached by climbing or removal of grate to get down? |
| 3. Was entry effected by breaking? | 9. Any evidence of marks of reaching point of entry? |
| 4. Any marks?* | 10. How was the entry effected at this point, and by what means? |
| 5. If so, where?† | 11. Property left behind by thief? |
| 6. How did the thief reach the point of breaking in? | |

Internal Examination.

- | | |
|--|--|
| 1. Did room entered contain stolen property, and when last seen? | 5. What tools or means used for this purpose? |
| 2. If not, describe by diagram on separate sheet. | 6. Any other article disturbed? |
| 3. Any marks?* | 7. Any trace of thief having been concealed inside the premises? |
| 4. How did the thief get to the property and if by force? | 8. Any property left by thief? |
| | 9. Anything to denote search for special articles? |

Concealment or Subterfuge.

- | | |
|--|---|
| Was it possible for anyone to have been concealed on the premises? | Are the whereabouts accessible? |
| What precautions are taken before leaving or retiring? | Have the servants a separate flight of stairs? |
| Who locks the doors and examines the windows? | In what position of the house? |
| Who keep the keys and where? | Could access be got from an outer door to these stairs? |
| Who knows of their whereabouts? | What room or rooms would have to be passed through? |

Duplicate or False Key.

- | | |
|---|--|
| Was entrance effected by duplicate or skeleton key? | Has the proper key been used? |
| If so, which door, front, back, or side? | If so, where is it kept in the day time? |
| What kind of locks on doors? | Could it be easily abstracted? |
| Any other kind of fastenings, and if used? | Is it left in the lock at night time? |

General.

- | | |
|---|---|
| What staff is employed inside the premises? | If not, who is suspected, and why? |
| Are they all "old" employees? | How long have they been visiting? |
| If not, what was their last employment, and for how long? | How was acquaintance formed? |
| What were their character? | What staff was employed outside the premises? |
| Is suspicion attached to any of them? | How long have they been employed? |
| If so, which one? | Previous character. |
| For what reason? | Any person recently employed, either outside, or inside, especially: window cleaners, chimney sweepers, etc.? |
| If still in the employ? | Where were the servants at the time of the robbery? |
| Are the visitors all personal friends of occupiers? | Financial status—is report genuine? |
| Are they all above suspicion? | |

Diagram of Premises.

- *Carefully define such as (a) finger, (b) boots, etc.

†Window, wall, door, light, etc.

B—Property Attacked.

Dwelling place.	Public or semi-public building.	Vehicle.
Factory.	Store or Shop.	Vessel.
Office.		Unclassified.

C—How Attacked?

1. Basement.	19. First floor.	37. Second floor to Z.
2. Ceiling.	20. Ceiling.	38. Ceiling.
3. Door.	21. Door.	39. Door.
4. Door, front.	22. Door, front.	40. Door, front.
5. Door, rear.	23. Door, rear.	41. Door, rear.
6. Door, side.	24. Door, side.	42. Door, side.
7. Floor.	25. Floor.	43. Floor.
8. Skylight.	26. Skylight.	44. Skylight.
9. Transom.	27. Transom.	45. Transom.
10. Transom, front.	28. Transom, front.	46. Transom, front.
11. Transom, rear.	29. Transom, rear.	47. Transom, rear.
12. Transom, side.	30. Transom, side.	48. Transom, side.
13. Wall.	31. Wall.	49. Wall.
14. Window.	32. Window.	50. Window.
15. Window, front.	33. Window, front.	51. Window, front.
16. Window, rear.	34. Window, rear.	52. Window, rear.
17. Window, show.	35. Window, show.	53. Window, show.
18. Window, side.	36. Window, side.	54. Window, side.

D—With What Attacked or Means of Attack?

1. Bodily force.	12. Brace and bit.	23. Saw.
2. Climbing.	13. Chisel or jimmy.	24. Screw driver.
3. Adjoining premises.	14. Drill.	<i>In Safe or Vault Attack.</i>
4. Fall pipe.	15. Glass cutter.	
5. Fence.	16. Hatchet or axe.	25. Combination manipulator.
6. Fire escape.	17. Hook and line.	26. Combination driver or pull.
7. Ladder.	18. Hook and pole.	27. Electricity.
8. Porch.	19. Key or lock pick.	28. Explosive.
9. Rope.	20. Missile.	29. Oxy-acetylene.
10. Concealment.	21. Nippers.	
11. Instrument.	22. Pick or shovel.	

E—Time of Attack.**F—Object of Attack.****G—Trademark.**

1. Assaulted occupant.	17. Pulled down blinds.
2. Ate food.	18. Ravished woman occupant.
3. Bare or stocking feet.	19. Secured front and rear door.
4. Bathed.	20. Smoked on premises.
5. Bound or gagged occupant.	21. Solicited clothing.
6. Changed clothes or shoes.	22. Solicited employment.
7. Chewed tobacco.	23. Solicited food.
8. Committed nuisance.	24. Solicited immoral act.
9. Cut telephone wires.	25. Solicited money.
10. Left note behind.	26. Solicited shelter.
11. Malicious damage to premises.	27. Used automobile.
12. Poisoned dog.	28. Used bike.
13. Pretended to be blind.	29. Used horse.
14. Pretended to be crippled.	30. Used horse-drawn vehicle.
15. Pretended to be deaf or dumb.	31. Used motorcycle.
16. Pretended to be looking for someone.	

Personal Description and Information.

1. Hair.	5. Age.	9. Occupation.
2. Eyes.	6. Build.	10. Complexion.
3. Height.	7. Beard.	Marks.
4. Weight.	8. Nativity.	Dressed.

LARCENY.

Name.

Date.

No.

Diagram of Premises.

Legend.

+ Entry.

△ Rooms ransacked.

□ Exit.

Room from which property was taken.

Preliminary.

1. Is it quite certain house or premises have not been broken into or broken out of?
2. When was property now missing last seen, by whom, and where?

Internal Examination.

1. In what room was the property?
2. Was it locked up?
3. Was the door of the room open or shut when last seen?
4. Was force used to reach property?
5. What tools, or means, used to reach it?
6. Any marks?*
7. If so, where?†
8. Anything found in room not usually there?
9. Have things been missed before; how often; what dates?
10. Nature of previous losses?
11. Who was in the house and where; between hours of theft?
12. Was admittance obtained by the following: (See Sections (a), (b), (c) and (d).)

(a) *Imposture and Trickery.*

Persons representing themselves to be gas, or water inspectors, telephone inspectors, etc.

By whom admitted?

If so, which rooms visited?

Was the person left alone; in which room; and for how long?

Who, besides the family or servants, have had access to the rooms?

For what reason, and by whom shown in?

Has any message been received at the house which has proved to be false?

If so, was it by telephone, letter, verbal message, or how?

Nature of such message?

Date of same?

What was done in consequence?

If servants employed; have they any visitors or "followers?"

When visiting, what room do they occupy?

Time of such visits?

Have the servants been visited by peddlers or fortune tellers?

When; number of visits; and if allowed in the house?

(b) *Concealment or Subterfuge.*

Was it possible for anyone to have been concealed on the premises?

What precautions are taken before leaving or retiring?

Who locks the doors and examines the windows?

Who keeps the keys, and where?

Who knows of their whereabouts?

Are the whereabouts accessible?

Have the servants a separate flight of stairs?

In what position of the house?

Could access be got from an outer door to these stairs?

What room or rooms would have to be passed through?

(c) *Duplicate or False Key.*

Was entrance effected by duplicate or skeleton key?

If so, which door, front, back, or side?

What kinds of locks on doors?

Any other kind of fastenings, and if used?

Has the proper key been used?

If so, where is it kept in the day time?

Could it be easily abstracted?

Is it left in the lock at night time?

(d) *General.*

What staff is employed inside the premises?

Are they all "old" employees?

If not, what was their last employment, and for how long?

What were their characters?

Is suspicion attached to any of them?

If so, which one?

For what reason?

If still in the employ?

Are the visitors all personal friends of occupants?

Are they all above suspicion?

If not, who is suspected, and why?

How long have they been visiting?

How was acquaintance formed?

What staff is employed outside the premises?

How long have they been employed?

Previous character?

Any person recently employed, either outside, or inside, especially: window

cleaners, chimney sweepers, etc.

Where were the servants at the time of the theft?

Financial status—is report genuine?

*Carefully define such as (a) finger, (b) boots, etc.

†Window, wall, light, etc.

LARCENY.

B—Property Attacked or Place of Attack (See Chart—State kind and size)

- | | | |
|--------------------|-------------------------------------|------------------|
| 1. Dwelling place. | 4. Public or semi-public buildings. | 6. Street. |
| 2. Factory. | 5. Store or shop. | 7. Vessel. |
| 3. Office. | | 8. Unclassified. |

C—How Attacked?

- | | | |
|---------------------------|----------------------|------------------------------------|
| <i>Stealing from.</i> | 18. Lobby. | 35. Room, state. |
| 1. Basement. | 19. Loft. | 36. Room, store. |
| 2. Cash register or till. | 20. Mail box. | 37. Room, study. |
| 3. Clothes line. | 21. Meter. | 38. Room, tool. |
| 4. Closet. | 22. Poor box. | 39. Room, waiting. |
| 5. Conservatory. | 23. Porch, front. | 40. Slot machine. |
| 6. Contribution box. | 24. Porch, rear. | 41. Telephone box. |
| 7. Cooler. | 25. Room, bath. | 42. Telephone booth. |
| 8. Counter. | 26. Room, check. | 43. Toilet. |
| 9. Desk. | 27. Room, class. | 44. Trunk. |
| 10. Display stand. | 28. Room, dining. | 45. Vault. |
| 11. Garden. | 29. Room, dressing. | 46. Vehicle (state kind). |
| 12. Gum machine. | 30. Room, engine. | 47. Wearing apparel, (state kind). |
| 13. Hall. | 31. Room, fire. | 48. Window (state kind). |
| 14. Kitchen. | 32. Room, living. | 49. Yard. |
| 15. Laboratory. | 33. Room, reception. | 50. Unclassified. |
| 16. Library. | 34. Room, sleeping. | |
| 17. Locker. | | |

D—With What Attacked or Means of Attack?

- | | | |
|-------------------------------|----------------------------|----------------------------|
| 1. Bodily force. | 12. Collecting. | 24. Inst. pick and shovel. |
| 2. Borrowing. | 13. Concealment. | 25. Inst. saw. |
| 3. Carrying away. | 14. Detaching. | 26. Inst. screw driver. |
| 4. Climbing. | 15. Driving away. | 27. Leading away. |
| 5. Climb, adjoining premises. | 16. Instrument. | 28. Missile. |
| 6. Climb, fall pipe. | 17. Inst. brace and bit. | 29. Pennyweighting. |
| 7. Climb, fence. | 18. Inst. chisel or jimmy. | 30. Riding away. |
| 8. Climb, fire escape. | 19. Inst. drill. | 31. Sneaking. |
| 9. Climb, ladder. | 20. Inst. glass cutter. | 32. Shoplifting. |
| 10. Climb, porch. | 21. Inst. hatchet or axe. | 33. Towing away. |
| 11. Climb, rope. | 22. Inst. hook and line. | 34. Wearing away. |
| | 23. Inst. nippers. | 35. Unclassified. |

E—Time of Attack.

F—Object of Attack.

G—Trademark.

- | | |
|--|---|
| 1. Buying business. | 29. Renting business. |
| 2. Buying goods. | 30. Renting rooms. |
| 3. Buying material to do work. | 31. Sent by friends or relative. |
| 4. Buying present for friend or relative. | 32. Sent by person in distress. |
| 5. Buying real estate. | 33. Suffering from disease or injury. |
| 6. Member of lodge or other organization. | 34. Left note behind. |
| 7. Member of well known family. | 35. Pretends to be blind. |
| 8. Member of well known firm. | 36. Pretends to be crippled. |
| 9. Met with accident. | 37. Pretends to be deaf and dumb. |
| 10. Money due. | 38. Pretends to be employed. |
| 11. Money for artificial member. | 39. Requests permission to inspect meter. |
| 12. Money for charities. | 40. Requests permission to inspect premises. |
| 13. Money for clothes. | 41. Requests permission to use telephone. |
| 14. Money for sick, injured or needy person. | 42. Requests permission to use toilet. |
| 15. Money for traveling. | 43. Solicits clothing. |
| 16. Money from business. | 44. Solicits employment. |
| 17. Money from home. | 45. Solicits food. |
| 18. Money from real estate. | 46. Solicits immoral act. |
| 19. Money inherited. | 47. Solicits money. |
| 20. Money lost. | 48. Solicits shelter. |
| 21. Money stolen. | 49. Soliciting. |
| 22. Money temporarily short of. | 50. Stealing while attending school or college. |
| 23. Money to be changed. | 51. Stealing while attending social function. |
| 24. Money to be distributed. | 52. Stealing while employed on premises. |
| 25. Looking for friend or relative. | 53. Stealing while guest or visiting. |
| 26. Refers to death of friend or relative. | 54. Used vehicle (State kind). |
| 27. Refers to friend or relative. | 55. Unclassified. |
| 28. Refers to well known people. | |

H—Personal Description and Information.

- | | | |
|------------|--------------|-----------------|
| 1. Hair. | 5. Age. | 9. Occupation. |
| 2. Eyes. | 6. Build. | 10. Complexion. |
| 3. Height. | 7. Beard. | Marks. |
| 4. Weight. | 8. Nativity. | Dressed. |

WORTHLESS CHECKS OR ORDERS.

Name.	Date.	No.
B—Person or Property Attacked (See Chart).		
1. Person.	8. Public servant or	15. Officers.
2. Agent.	9. officer.	16. Public and semi-public
3. Clerk.	10. Servant.	buildings.
4. Commercial.	11. Trades.	17. Stores and shops.
5. Laborer.	12. Transportation.	18. Vehicles.
6. Miscellaneous.	13. Property.	19. Vessels.
7. Professional.	14. Dwelling place.	20. Unclassified.
	15. Miscellaneous.	

C—How Attacked?

1. Forging.	4. Passing fraudulent.	6. Raising.
2. Passing fictitious.	5. Passing raised.	7. Unclassified.
3. Passing forged.		

D—With What Attacked or Means of Attack?

1. Check.	6. Check, protectograph-	10. Draft.
2. Check, certified.	ed.	11. Note.
3. Check, counter.	7. Check, rubber-stamp-	12. Order.
4. Check, engraved.	ed.	13. Order, express.
5. Check, pay.	8. Check, travelers.	14. Order, postal.
	9. Check, typewritten.	15. Unclassified.

E—Time of Attack.**F—Object of Attack.****G—Trademark.**

1. Buying business.	29. Pretends to be blind.
2. Buying flowers, etc., for deceased.	30. Pretends to be customer.
3. Buying goods.	31. Pretends to be crippled.
4. Buying material to do work.	32. Pretends to be deaf and dumb.
5. Buying present for friend, relative or sick person.	33. Pretends to be employed in vicinity.
6. Buying real estate.	34. Refers to death of friend or relative.
7. Depositing check, draft, etc., to credit of self.	35. Refers to friend or relative.
8. Exhibits bank's receipt or deposit book.	36. Refers to well known person or persons.
9. Exhibits check book.	37. Renting business.
10. Impersonating another.	38. Renting farm.
11. Member of lodge or other organization (state kind).	39. Renting house.
12. Member of well known family.	40. Renting rooms.
13. Member of well known firm.	41. Remittance from business.
14. Met with accident.	42. Remittance from employer.
15. Money due.	43. Remittance from estate.
16. Money for artificial member.	44. Remittance from relative.
17. Money for clothes.	45. Representing fictitious firm.
18. Money from business.	46. Representing well known firm.
19. Money from home.	47. Sent by friend or relative.
20. Money from real estate.	48. Sent by person in distress.
21. Money inherited.	49. Starting business.
22. Money lost.	50. Steals check.
23. Money or goods for charity.	51. Steals check from mail.
24. Money or goods for sick, needy or injured person.	52. Suffering from disease or injury.
25. Money stolen.	53. Uses conveyance.
26. Money temporarily short of.	54. Uses bogus letter of credit.
27. Money to be distributed.	55. Uses bogus letter of introduction.
28. Pretends to be acquaintance.	56. Uses bogus telegram.
	57. Uses bogus firm name.
	58. Uses defunct firm name.
	59. Unclassified.

H—Personal Description and Information.

1. Hair.	5. Age.	9. Occupation.
2. Eyes.	6. Build.	10. Complexion.
3. Height.	7. Beard.	Marks.
4. Weight.	8. Nativity.	Dressed.

Fac Simile of Check.

FALSE PRETENSES, TRICK AND IMPOSTURE.

Name.

Date.

No.

B—Person or Property Attacked (See Chart).

- | | | |
|-------------------------------|---------------------------------------|-----------------------|
| 1. Person. | 9. Servant. | 17. Stores and shops. |
| 2. Agent. | 10. Trades. | 18. Vehicles. |
| 3. Clerk. | 11. Transportation. | 19. Vessels. |
| 4. Commercial. | 12. Property. | 20. Unclassified. |
| 5. Laborer. | 13. Dwelling place. | |
| 6. Miscellaneous. | 14. Miscellaneous. | |
| 7. Professional. | 15. Officers. | |
| 8. Public servant or officer. | 16. Public and semi-public buildings. | |

C—How Attacked?

- | | | |
|------------------------------|-----------------------------|--|
| 1. Stealing by. | 13. Courtship. | 26. Selling. |
| 2. Absconding. | 14. Employing. | 27. Sending. |
| 3. Advertising. | 15. Exchanging. | 28. Short changing. |
| 4. Appropriating. | 16. Fortune telling. | 29. Sleight of hand. |
| 5. Bailee. | 17. Impersonating. | 30. Sneaking. |
| 6. Betting. | 18. Intercepting. | 31. Soliciting or canvassing. |
| 7. Borrowing. | 19. Marrying. | 32. Solidating or canvassing unauthorized. |
| 8. Calling for. | 20. Matching. | 33. Telegraphing. |
| 9. Calling for unauthorized. | 21. Misrepresenting. | 34. Telephoning. |
| 10. Collecting. | 22. Obtaining for repair. | 35. Writing. |
| 11. Collecting unauthorized. | 23. Obtaining for approval. | 36. Unclassified. |
| 12. Concealment. | 24. Pennyweighting. | |
| | 25. Pickpocket. | |

D—With What Attacked or Means of Attack?

- | | |
|---------------------------------------|---|
| 1. Bogus concerns, goods or methods. | 28. Bogus title to property. |
| 2. Bogus accounts. | 29. Bogus transportation. |
| 3. Bogus advertising. | 30. Bogus unions. |
| 4. Bogus agency. | 31. Faked or fixed match, game or race. |
| 5. Bogus amusement. | 32. Billiards. |
| 6. Bogus business. | 33. Boxing. |
| 7. Bogus charity. | 34. Cards. |
| 8. Bogus claim. | 35. Chess or checkers. |
| 9. Bogus documents. | 36. Dice. |
| 10. Bogus employment. | 37. Horse race. |
| 11. Bogus freight or express charges. | 38. Lock game. |
| 12. Bogus gold bricks. | 39. Matching coin. |
| 13. Bogus goods other than jewelry. | 40. Pool. |
| 14. Bogus investment. | 41. Rowing. |
| 15. Bogus jewelry. | 42. Running. |
| 16. Bogus lottery. | 43. Shell and pea. |
| 17. Bogus measures. | 44. Swimming. |
| 18. Bogus message. | 45. Wheel of fortune. |
| 19. Bogus money. | 46. Wrestling. |
| 20. Bogus money in box. | 47. Miscellaneous. |
| 21. Bogus partner. | 48. Badger game. |
| 22. Bogus profession. | 49. Dropping the purse. |
| 23. Bogus purchase. | 50. Dropping the ring. |
| 24. Bogus society or organization. | 51. Panel game. |
| 25. Bogus stock. | 52. Threatening letter. |
| 26. Bogus subscription. | 53. Unclassified. |
| 27. Bogus ticket. | |

E—Time of Attack.

F—Object of Attack.

G—Trademark.

- | | |
|--|---|
| 1. Buying business. | 29. Renting business. |
| 2. Buying goods. | 30. Renting rooms. |
| 3. Buying material to do work. | 31. Sent by friend or relative. |
| 4. Buying present for friend or relative. | 32. Sent by person in distress. |
| 5. Buying real estate. | 33. Suffering from disease or injury. |
| 6. Member of lodge or other organization. | 34. Left note behind. |
| 7. Member of well known family. | 35. Pretends to be blind. |
| 8. Member of well known firm. | 36. Pretends to be crippled. |
| 9. Met with accident. | 37. Pretends to be deaf and dumb. |
| 10. Money due. | 38. Pretends to be employed. |
| 11. Money for artificial member. | 39. Requests permission to inspect meter. |
| 12. Money for charities. | 40. Requests permission to inspect premises. |
| 13. Money for clothes. | 41. Requests permission to use telephone. |
| 14. Money for sick, injured or needy person. | 42. Requests permission to use toilet. |
| 15. Money for traveling. | 43. Solicits clothing. |
| 16. Money from business. | 44. Solicits employment. |
| 17. Money from home. | 45. Solicits food. |
| 18. Money from real estate. | 46. Solicits immoral act. |
| 19. Money inherited. | 47. Solicits money. |
| 20. Money lost. | 48. Solicits shelter. |
| 21. Money stolen. | 49. Soliciting. |
| 22. Money temporarily short of. | 50. Stealing while attending school or college. |
| 23. Money to be changed. | 51. Stealing while attending social function. |
| 24. Money to be distributed. | 52. Stealing while employed on premises. |
| 25. Looking for friend or relative. | 53. Stealing while guest or visiting. |
| 26. Refers to death of friend or relative. | 54. Used vehicle (State kind). |
| 27. Refers to friend or relative. | 55. Unclassified. |
| 28. Refers to well known people. | |

H—Personal Description and Information.

- | | | |
|------------|--------------|-----------------|
| 1. Hair. | 5. Age. | 9. Occupation. |
| 2. Eyes. | 6. Build. | 10. Complexion. |
| 3. Height. | 7. Beard. | Marks. |
| 4. Weight. | 8. Nativity. | Dressed. |

ROBBERY.

Name.

Date.

No.

B—Person or Property Attacked (See Chart).

1. Person.	9. Servant.	17. Stores and shops.
2. Agent.	10. Trades.	18. Vehicles.
3. Clerk.	11. Transportation.	19. Vessels.
4. Commercial.	12. Property.	20. Unclassified.
5. Laborer.	13. Dwelling place.	
6. Miscellaneous.	14. Miscellaneous.	
7. Professional.	15. Offices.	
8. Public servant or officer.	16. Public and semi-public buildings.	

C—How Attacked?

1. Beating.	6. Garroting.	11. Threatening or holding up.
2. Binding and gagging.	7. Intoxicating.	12. Unclassified.
3. Blinding.	8. Rolling.	
4. Cutting.	9. Snatching.	
5. Drugging.	10. Striking.	

D—With What Attacked or Means of Attack?

1. Blackjack.	5. Cayenne.	9. Liquor.
2. Bludgeon or club.	6. Dirk, knife or razor.	10. Missile.
3. Bodily force.	7. Drugs.	11. Sandbag or slungshot.
4. Brass knuckles.	8. Firearms.	12. Unclassified.

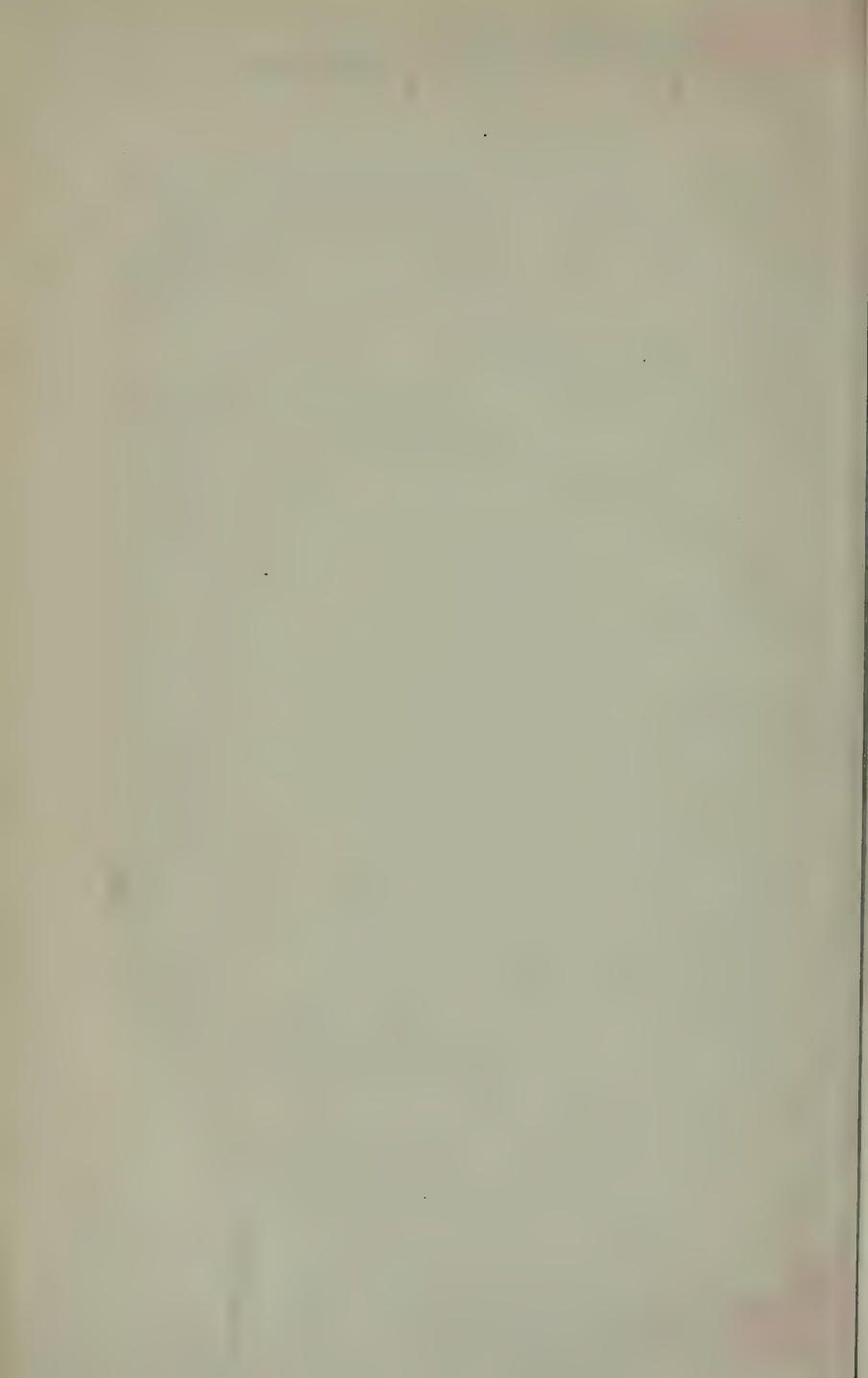
E—Time of Attack.**F—Object of Attack.****G—Trademark.**

1. Bound and gagged victim.	14. Profane.
2. Brutal.	15. Ravished woman victim.
3. Chewed tobacco.	16. Smoked.
4. Communicative.	17. Solicits clothing.
5. Cool.	18. Solicits employment.
6. Gentlemanly.	19. Solicits food.
7. Left note behind.	20. Solicits immoral act.
8. Nervous.	21. Solicits information.
9. Non-communicative.	22. Solicits light or match.
10. Pretended to be blind.	23. Solicits money.
11. Pretended to be crippled.	24. Solicits shelter.
12. Pretended to be deaf and dumb.	25. Used vehicle (State kind).
13. Pretended to be looking for friends or relatives.	26. Used mask (State kind).
	27. Unclassified.

H—Personal Description and Information.

1. Hair.	5. Age.	9. Occupation.
2. Eyes.	6. Build.	10. Complexion.
3. Height.	7. Beard.	Marks.
4. Weight.	8. Nativity.	Dressed.

Officer's Report.



VETERANS' HOME OF CALIFORNIA

ANNUAL REPORT

OF

Board of Directors and Officers

Fiscal Year ended June 30, 1919

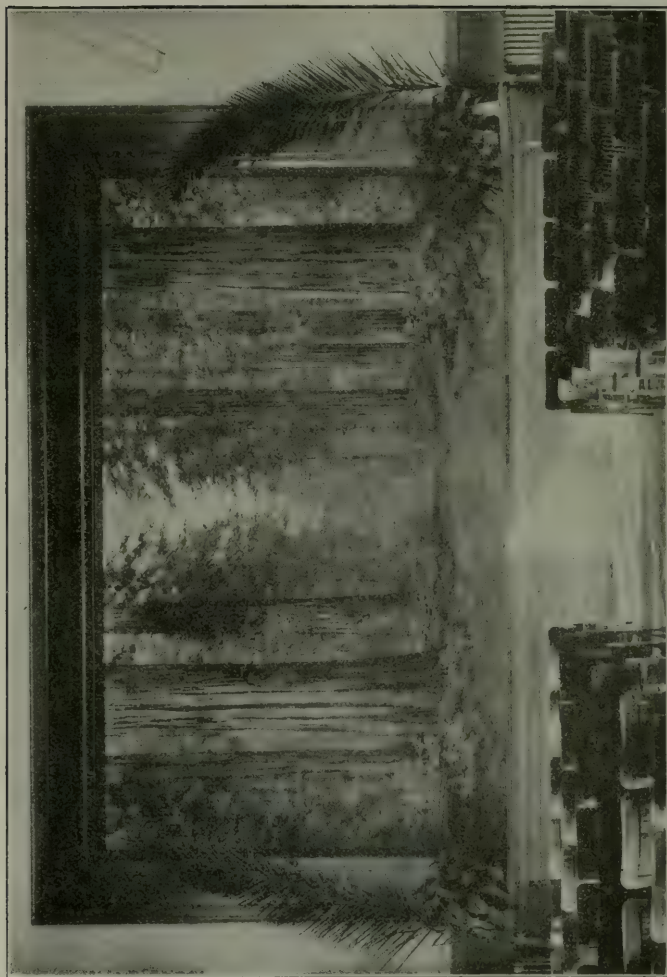
Location of Home:

Veterans' Home Post Office, Napa County, California
Railroad Station, Yountville



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO

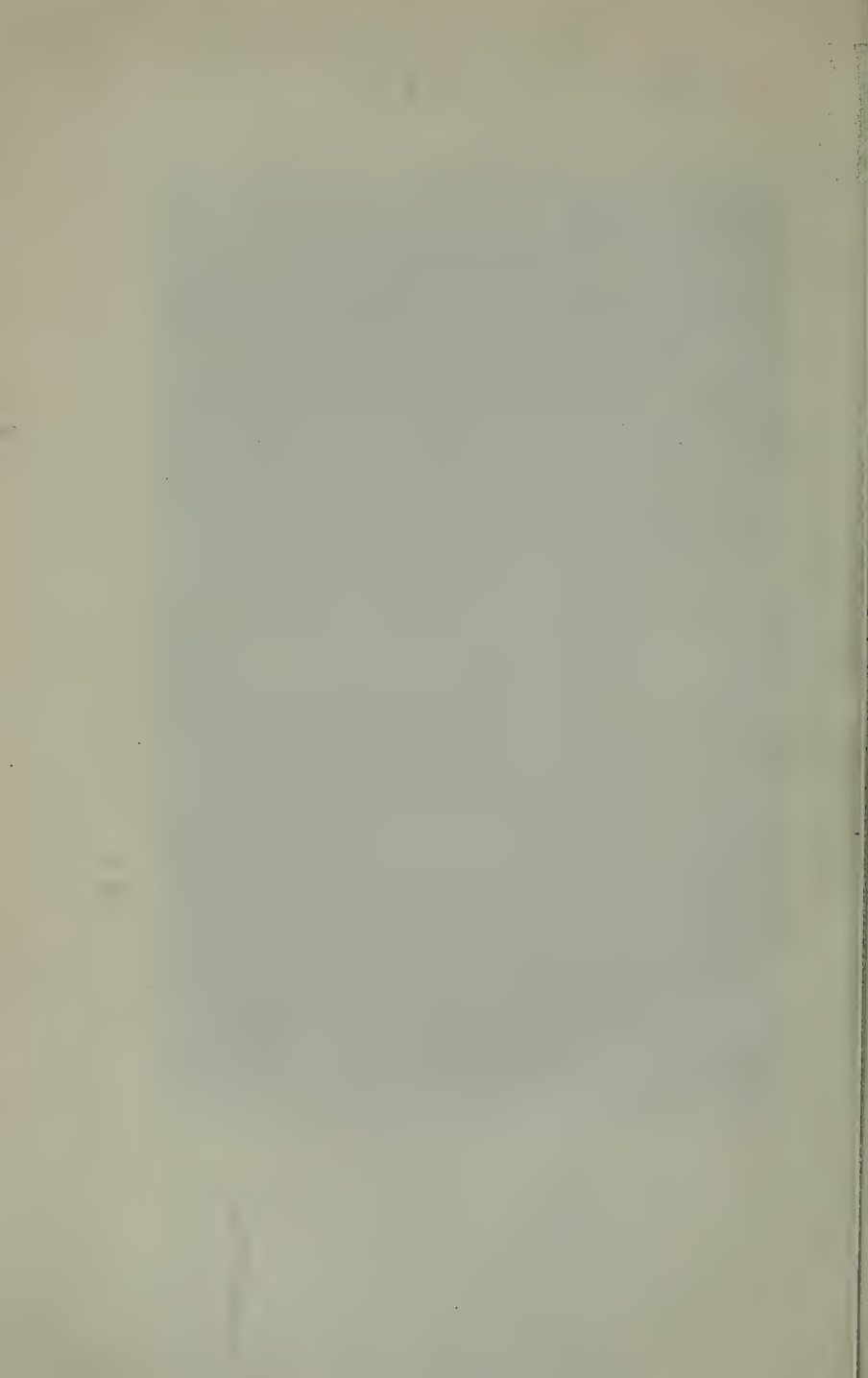
1920



Interior View of Lincoln Theater. Showing Drop Curtain.

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CHIEF ENGINEER'S REPORT -----	17
QUARTERMASTER-COMMISSARY'S REPORT -----	26



BOARD OF DIRECTORS AND OFFICERS, 1918-1919.

SAMUEL W. BACKUS-----San Francisco
President and ex officio member of all committees.

HUGH M. BURKE-----San Francisco
Vice President.

JOHN C. CURRIER-----San Francisco

G. PARKER DILLON, M.D.-----Sacramento

E. B. HINMAN-----Sacramento

JAMES O. PREWETT-----Sacramento

C. DE COLMESNIL-----Secretary-Treasurer.

OFFICIAL AND MEDICAL STAFF, RESIDENT AT VETERANS' HOME, 1918-1919.

COLONEL J. P. EDMUNDS-----Commandant

C. DE COLMESNIL-----Secretary-Treasurer

MAJOR C. B. CALDWELL, M.D.-----Surgeon

CAPTAIN T. W. LAWRENCE-----Chief Engineer

CAPTAIN GEO. A. HELFERT-----Quartermaster-Commissary

CAPTAIN D. T. DE LA HOYDE-----Assistant Surgeon

STANDING COMMITTEES, 1918-1919.

Auditing Committee.

DIRECTORS CURRIER, HINMAN.

Buildings and Grounds Committee.

DIRECTORS BURKE, CURRIER.

Hospital Committee.

DIRECTORS DILLON, PREWETT, HINMAN.

Library and Amusements Committee.

DIRECTORS BURKE, PREWETT.

Law Committee.

DIRECTORS PREWETT, BURKE.

BOARD OF SURVEY.

COLONEL J. P. EDMUNDS-----Commandant

MAJOR C. B. CALDWELL-----Surgeon

CAPTAIN GEO. A. HELFERT-----Quartermaster-Commissary



Main Avenue, Looking North.

PRESIDENT'S REPORT.

VETERANS' HOME OF CALIFORNIA, October 15, 1919.

*To His Excellency, WILLIAM D. STEPHENS,
Governor of California.*

SIR: In submitting this, my eighteenth annual report as President of the Board of Directors of the Veterans' Home of California, I desire to express the thanks and appreciation of the Directors for the confidence manifested by the Governor in reappointing the Board of Directors.

Herewith I hand you reports of the Commandant, Secretary-Treasurer, Quartermaster-Commissary and Engineer for the biennial period July 1, 1918, to June 30, 1919.

While the year has been fraught with many difficulties, financial and otherwise, we feel that the Veterans under our care have been given every comfort and attention in our power to give them.

Our maintenance appropriation for the last biennial period proving inadequate to meet the demands of the high cost of labor and food, we were authorized to create a deficit which will be met by the state. We trust the increased appropriations for the present biennial periods may be sufficient to carry us through and still allow us to supply the members of the Home with all possible necessities.

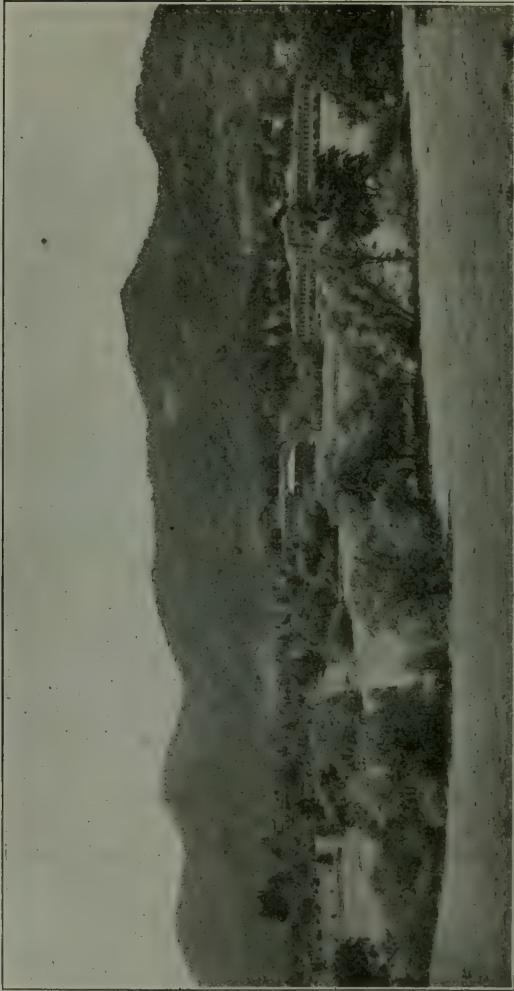
The United States government at present contributes \$100 per annum per capita toward the support of the Home. We have made request that this appropriation be increased to \$120 per annum per capita and sincerely trust this may be accomplished, toward the end that increased comforts may be given the men.

Since my last report the personnel of the officers has somewhat changed in that Captain F. C. Butler has succeeded G. A. Helfert as Quartermaster-Commissary and Dr. J. N. Blood succeeded Dr. G. T. De La Hoyde as Assistant Surgeon.

In closing, permit me to extend the thanks of the Board of Directors to the Governor of the state and different state officials with whom we have come in contact.

Respectfully submitted,

SAMUEL W. BACKUS,
President, Board of Directors.



Skyline Looking West.

EXPLANATORY.

Absence of Hospital report is due to the failure of the Chief Surgeon, June 30, 1919, to file the report. Since that time a duly accredited Inspector from the National Board of Managers, D. V. S., carefully inspected the Hospital of the Veterans' Home of California, and found the institution in highly creditable condition; the patients well fed and clothed, the help ample and efficient, and the members in all departments humanely cared for.

At a special meeting of the Board of Directors, October 31, 1919, Captain Nelson M. Holderman, an oversea veteran, who was wounded at the battle of Argonne, France, and subsequently decorated with the American Distinguished Service Cross and the French Croix de Guerre for valor, also cited in orders for bravery in action, was unanimously elected Commandant of the Home. Captain Holderman is from Santa Ana, California, where he has resided since he was seven years old. He enlisted in the National Guard of California in 1904 and from that time has continued in the military service until the present date.



Entrance to Reservation.

REPORT OF COMMANDANT.

VETERANS' HOME, October 1, 1919.

*To the President and Members of the Board of Directors,
Veterans' Home of California.*

GENTLEMEN: I have the honor to submit herewith reports of the Secretary-Treasurer, Quartermaster-Commissary, and Chief Engineer, for the fiscal year ended June 30, 1919.

Colonel J. E. Miller, Inspector-General, N.H.D. V.S., made the regular inspection and reported favorably on matters pertaining to the Home.

During the year there have been the regular entertainments, and all national and state holidays have been fittingly observed.

Motion picture shows have been shown four times each week and these seem to afford much entertainment to members of the Home.

The new Chapel has been completed and is a source of comfort and satisfaction to those desiring to attend services. The different religions hold services as they desire and all religions are represented without discrimination.

Some difficulty has been experienced in the matter of securing new uniforms. The uniform has been changed from the blue, which was formerly worn, to the olive drab.

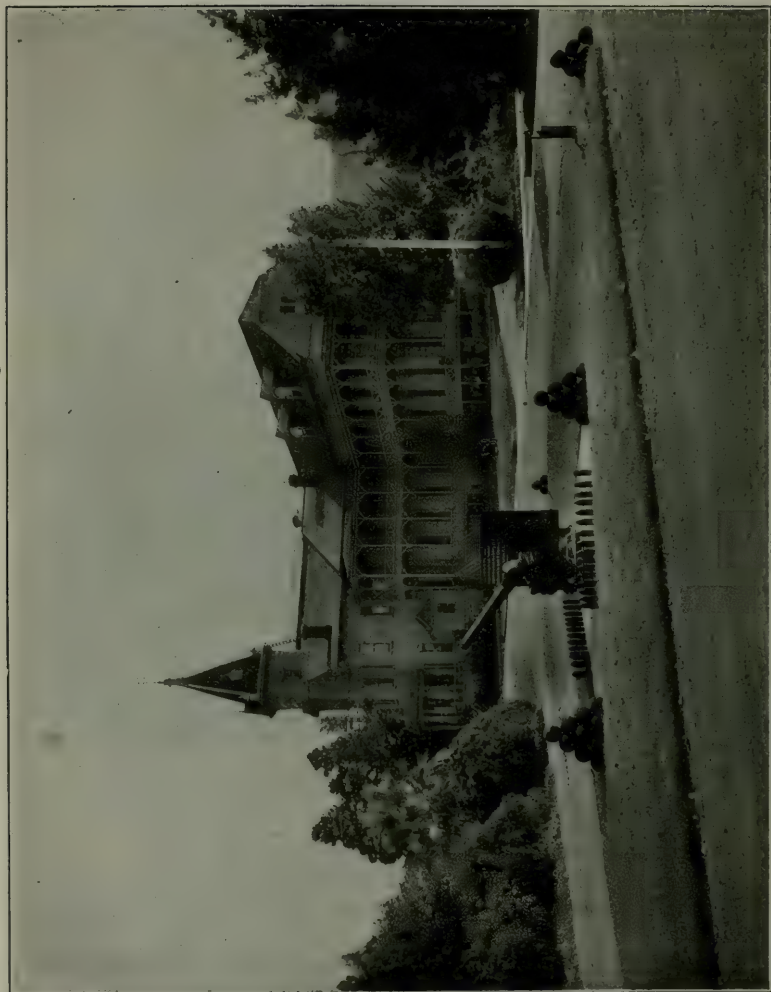
This summer, the members of the Home, assisted by officers and employees, successfully gave a lawn fete which was greatly enjoyed by all. It extended over two days and one evening and was attended by many people outside the Home as well as those resident here. A dance was held, as well as a delightful entertainment, and a number of booths were run. In all, the sum of \$678.63 was taken, and after paying all expenses, the net proceeds, amounting to \$300.66, were turned over to the Ladies of Betsy Ross Circle, G. A. R., to be used in fitting up the rest house provided by those ladies for the wives of Veterans who wish to visit at the Home.

On May 23, 1919, the Home lost Thomas E. Noe, Private Co. H, 1st Indiana Infantry, the last Mexican War Veteran at the Home. Mr. Noe was ninety-three years old.

During the year there has been comparatively little drunkenness. The discipline at the Home has been very satisfactory.

New quarters have been fitted up for the Assistant Surgeon which promise to be very satisfactory.

J. P. EDMUNDS,
Colonel-Commandant.



Administration Building.

REPORT OF SECRETARY-TREASURER.

VETERANS' HOME, July 1, 1919.

*To the President and Board of Directors,**Veterans' Home of California.*

(Through COL. J. P. EDMUNDS, Commandant.)

GENTLEMEN: I have the honor to submit herewith statement of receipts and disbursements and statistics of membership of the Veterans' Home of California for the fiscal year ended June 30, 1919.

GENERAL FUND.

Receipts.

July 1, 1918, to June 30, 1919—

State and United States appropriations.....	\$238,210 58
Board of guests at directors' cottage.....	200 60
Rents collected	130 00
Miscellaneous refundments	168 61
Sale of purchased goods.....	4,220 14
Home department productions sales.....	5,562 82
Percentage on sales.....	258 68
Clothing refunded	221 08
Appropriations refunded	17 25
Sale of junk.....	1,092 85
Board and treatment in hospital.....	26 25
Board, main dining room.....	38 02
Sale of rags and sacks.....	84 38
	<hr/> \$250,231 26

Disbursements.

July 1, 1918, to June 30, 1919—

Paid approved bills and pay rolls.....	\$237,794 79
Remitted to state treasurer.....	11,929 33
Excess amounts allowed on pay rolls and bills and returned to state treasurer.....	507 14
	<hr/> \$250,231 26

There is, in the treasurer's office, a \$500 revolving fund belonging to the general fund.

POST FUND.

Receipts.

July 1, 1918, balance on hand, open account.....	\$337 44
July 1, 1918, to June 30, 1919—	
Post store receipts.....	\$11,829 54
Moving picture shows.....	2,027 15
Interest and dividends.....	1,694 30
Transportation advanced to members, refunded.....	17 00
Transfer from savings accounts.....	3,940 50
Post store revolving fund returned.....	175 00
Returns from dance receipts.....	27 82
Sale of old papers.....	6 94
Premiums on bonds.....	4 48
Empty bottles returned.....	13 98
Rebate on cigars.....	7 50
	<hr/> 19,744 21
	\$20,081 65

Disbursements.

July 1, 1918, to June 30, 1919—

Paid approved bills and pay rolls----- 17,401 92

June 30, 1919, balance, open account----- \$2,679 73

Savings account ----- 7,041 25

Revolving funds ----- 1,025 00

June 30, 1919, total to credit of post fund----- \$10,745 98

SPECIAL DEPOSIT FUND.*Receipts.*

July 1, 1918—Balance on hand----- \$22,104 79

July 1, 1918, to June 30, 1919—

Received from depositors----- \$34,951 67

Interest on savings accounts----- 650 40

35,602 07

\$57,706 86*Disbursements.*

July 1, 1918, to June 30, 1919—

Paid to depositors and orders from depositors----- \$25,917 97

Transferred to posthumous account----- 9,222 38

35,140 35

June 30, 1919—balance to credit of special deposit account---- \$22,566 51

Of above balance, depositors' credits amount to \$17,448.40, and interest on deposits \$5,108.11. Of the latter the sum of \$4,000 has been invested in United States Liberty Bonds.

Pension checks amounting to \$122,209.70 were cashed for pensioners during the year, and in the same period we opened 113 new special deposit accounts, making a total of 215 accounts handled during the year, of which 61 have been closed and 45 transferred to posthumous account, leaving 109 active accounts, June 30, 1919.

During the year, 529 deposits were made by members, 744 payments made in cash and 489 by check. In all, there were 1807 transactions in the special deposit account.

**STATISTICS AS TO MEMBERSHIP, GAINS, LOSSES, ETC., DURING THE
YEAR ENDING JUNE 30, 1919.**

Membership of Home June 30, 1918----- 748

New admissions during the year—

Survivors of Civil War----- 88

Survivors of Indian wars----- 17

Survivors of Spanish-American War----- 72

Survivors of foreign service----- 8

Total admissions ----- 185

By readmission ----- 277

Total gain ----- 462

Losses during the year—

By discharge, own request----- 345

By discharge, cogent reasons----- 2

By discharge, report of surgeon----- 1

Dropped, absent without leave----- 32

Dropped, not renewing furlough----- 32

By death ----- 141

Total loss ----- 553

Net loss ----- 91

Membership of Home, June 30, 1919----- 657

Segregation as to wars—	
Civil War	446
Indian wars	48
Spanish-American War	157
Foreign service	6
Total	657

Average present during the year	621.7
Average present and absent during the year	700.6
Average absent with leave	73
Average absent without leave	5.9
Average sick	134.2
Average age of members admitted—years	63.2
Average age of Civil War veterans—years	73.4
Average age of Indian War veterans—years	69.7
Average age of Spanish-American War veterans—years	55.9
Average age of foreign service veterans—years	54
Average age of all living members—years	72.1
Average age of all members dying during the year	74.7

Total admissions to June 30, 1919	7,486
Highest number present during the year	673
Highest number present and absent during the year	748
Average T.A.P.	8.8

Average number sick, with leave, without leave, present, present and absent, whole number cared for, gain and loss, at Veterans' Home of California from June 30, 1890, to June 30, 1918.

During the year ending June 30	Average sick		Absent with leave		Absent without leave		Average present		Average present and absent		Whole number cared for		Gain			Loss					
													By admission	By readmission	Total	By discharge	By summary discharge	By dishonorable discharge	By dropped from roll	By death	Total
1890	25	32	2	203	236	304	136	9	145	42	14	23	17	96							
1891	31	49	3	233	279	361	192	17	209	59	5	25	23	112							
1892	122	75	7	334	416	542	378	56	364	116	20	68	44	248							
1893	163	104	9	411	524	591	238	83	311	123	16	68	32	239							
1894	44	48	11	416	475	562	291	114	405	348	30	62	42	492							
1895	43	34	6	442	482	516	263	203	466	277	34	51	35	397							
1896	48	47	8	553	588	588	275	224	499	300	36	28	51	415							
1897	50	40	11	600	651	651	237	198	455	229	25	11	68	42	375						
1898	74	51	11	624	686	686	197	189	386	247	47	5	60	30	397						
1899	103	48	13	674	735	735	206	216	452	168	17	2	105	51	373						
1900	115	66	17	689	772	772	186	218	404	218	19	3	133	68	441						
1901	128	70	15	703	788	788	189	225	414	153	10	4	120	74	361						
1902	128	71	14	735	820	820	186	199	385	214	43	4	88	60	409						
1903	116	104	12	709	825	825	193	201	394	124	59	2	45	76	306						
1904	124	141	20	726	887	887	197	175	372	146	37	69	75	327							
1905	127	140	25	730	895	895	215	166	381	130	65	1	97	72	365						
1906	143	115	11	764	895	895	180	300	380	265	76	1	82	70	494						
1907	135	86	6	721	813	813	131	192	323	15	20	2	31	88	326						
1908	139	85	10	761	856	856	223	214	437	120	50	3	78	94	345						
1909	160	120	10	834	971	971	268	181	449	119	31	6	68	120	334						
1910	159	179	13	855	1047	1049	273	164	437	131	20	2	105	86	344						
1911	178	228	16	925	1169	1180	324	154	478	275	6	5	69	133	440						
1912	208	159	15	962	1156	1164	292	209	501	310	3	1	93	107	514						
1913	208	130	10	944	1084	1094	259	278	537	339	13	2	150	120	624						
1914	195	117	11	912	1041	1054	294	299	593	321	3	4	102	139	569						
1915	214	84	7	972	1063	1068	340	304	644	365	2	3	132	136	638						
1916	211	83	8	936	1020	1031	228	247	475	319			101	133	553						
1917	206	88	6	878	974	980	214	231	475	333			73	134	540						
1918	204	82	7	777	866	871	218	222	440	421			78	110	610						
1919	134	73	6	622	701	710	185	277	462	348			64	141	553						

NATIVITY.

Native born	-----	4,674
Foreign born	-----	2,812

Nativity of Foreign Born.

Australia	-----	3	Mexico	-----	1
Austria	-----	25	New Brunswick	-----	2
Belgium	-----	1	Norway	-----	33
Canada	-----	174	Nova Scotia	-----	14
Denmark	-----	64	Poland	-----	13
England	-----	259	Portugal	-----	1
Finland	-----	2	Prussia	-----	27
France	-----	70	Russia	-----	3
Germany	-----	612	Scotland	-----	97
Hawaii	-----	1	Sweden	-----	93
Holland	-----	3	Switzerland	-----	47
Ireland	-----	1,232	Wales	-----	14
Italy	-----	2	Scattering	-----	19

Total number admitted 7,486, and readmitted 6,083, making a total of 13,569 since the organization of the Home.

Respectfully submitted.

C. DE COLMESNIL,
Secretary-Treasurer.

ANNUAL REPORT OF ENGINEER FOR FISCAL YEAR
ENDED JUNE 30, 1919.

VETERANS' HOME, CALIFORNIA, July 18, 1919.

General Samuel W. Backus, President, and the

Board of Directors, Veterans' Home, California.

(Through COL. J. P. EDMUNDS, Commandant.)

GENTLEMEN: I have the honor to present, herewith, the following report of the work performed by the various departments under my supervision, during the fiscal year ended June 30, 1919.

TREASURER'S OFFICE.

One three-compartment tray made for office; new table made, 12 galvanized iron voucher boxes made; table shellaced and varnished; voucher boxes painted and enameled.

SERGEANT MAJOR'S OFFICE.

Four tin boxes for pension certificates made.

QUARTERMASTER DEPARTMENT—OFFICE AND SHOPS.

Roof of flour storage room repaired; platform for flour and cereals made for Commissary storeroom; railings placed in same room; 4 dozen insect sprayers made for issue; 4-gallon galvanized iron gasoline bucket made; 1 galvanized iron gallon and 1 tin quart measures made, and 10 garbage cans.

DAIRY, HORSE BARN AND EQUIPMENT.

New watering trough made and installed at horse barn; hardwood tailboard and battery box made for bus; new gate made for cow yard; stalls in horse barn overhauled and repaired; 1 pair of wagon skids made; platform made for separator in dairy barn; ground marker for farm, standard and side board made for auto truck, gasoline tank and supply pipes for tractor have been repaired; stove pipe made for blacksmith shop.

HOG AND CHICKEN RANCH.

Building, made of corrugated galvanized iron, has been erected at chicken ranch, same to be used as a feed storage house; garbage cans at hog ranch have been overhauled and repaired; drinking fountains for small chicks have been overhauled and repaired; new shell hoppers made for chicken ranch.

BUTCHER SHOP.

Rack for hanging meat has been made and installed in the slaughter-house; meat block has been dressed and repaired; 1 lard press made; large galvanized iron tub made; 6 meat tubs lettered.

MAIN DINING ROOM AND KITCHEN.

Coffee urn at main kitchen has been crated for shipment; floor grating renewed and new table made for dish-washing room; 12 vegetable boxes made for vegetable room; screens in main dining room have been overhauled and replaced where needed; skylight awning was overhauled and repaired; shipping box for phonograph was made; alterations have been made in matrons' dining room; 14 dining room and 11 work tables have been painted; 6 tubs lettered for vegetable room; new galvanized iron tops placed on tables in main kitchen; copper bottom placed on kettle; 2 large tin dippers, 1 large tin vessel for pancake batter, and 3 large dish pans made for main kitchen; copper kitchen utensils were overhauled and repaired; potato steamer made; drainers for steam kettles repaired; new copper strainer made; 2 dozen tin dippers made for kitchen; drain pans have been made for dish-washing room; galvanized iron strainer made for sewer pipe in main kitchen; dishpans were overhauled and new bottoms placed where needed; hot water storage tank in main kitchen has been removed as same was leaking badly and, as it was impossible to be repaired here, a new tank has been ordered by the State Department of Engineering, and same will be installed immediately upon arrival; this tank had been in service about twenty-five years.

ORCHARD.

One hundred new prune trays made and old trays overhauled and repaired wherever practical; addition has been made to shed at prune drying plant for the storage of prune trays; step ladders and lug boxes used in fruit picking have been overhauled and repaired.

HOSPITAL.

A two-compartment wash tray frame made for Assistant Surgeon's quarters in sanitary cottages; forms have been made for concrete catch basins at new hospital buildings; 2 large wardrobes and an additional kitchen table with shelving have been made for serving diets; two-compartment wooden wash tray made for use in hospital laundry; carpenter has been employed at hospital all the year doing needed repairs; shelving for surgical instruments has been painted and enameled; interior of new quarters for Assistant Surgeon as well as porches have been painted; new addition to dining room painted; interior of ward

No. 3 has been painted; interior of operating room has been painted and enameled; writing desk stained and varnished; 3 blackboards painted; 5 bed screens, 3 cupboards and 26 tables painted and enameled; ceiling between ward No. 3 and toilet kalsomined; cabinet in operating room painted; 52 commodes painted and enameled for new tubercular wards; linen closet painted; medicine cabinet painted and enameled; 1 locker, 1 food carrier painted and enameled; 7 lights of glass renewed in main hospital and 13 lights in old annex; serving table in main dining room has been painted; 37 bed tags, 1 locker door, 18 iron settees, 1 ice box, 1 bread box, 1 cracker box, and 1 closet painted; 1 two-compartment galvanized iron wash tray made for Assistant Surgeon's quarters; 1 galvanized iron chimney top for same; galvanized iron flashings and tin shingles made for new tubercular wards; galvanized iron vent pipe made for same; two 2-quart milk cans made for Assistant Surgeon; 2 galvanized iron smoke stacks made and ventilators repaired for new skylights over kitchen and dining room; new shafting turned for dish-washing machine; six extension cords, with swivel attachments, have been made; motor of vegetable peeling machine was taken out and sent for rewiring; same has been returned and installed.

COMMANDANT'S RESIDENCE.

Screens and window shades were overhauled and replaced where needed; 7 chairs and 1 table stained and varnished.

SURGEON'S RESIDENCE.

Repairs made to roof; new shelving placed, kitchen and work tables made.

TREASURER'S RESIDENCE.

Six chairs stained and varnished.

QUARTERMASTER'S RESIDENCE.

Bread board made; dish cupboard and flour bin made and installed; picture moulding placed on walls of parlor and dining room; fence built around rabbit hutch; book case and library table made; all this work has been painted where necessary; electric wiring and connections made for the installation of an electric heater.

DIRECTOR'S COTTAGE.

Ironing board made; screens have been overhauled and replaced where needed; stepladder made; skylight over kitchen has been overhauled and repaired; small dining room, entry and coal shed have been painted and kalsomined; wires have been run; connections made for

the installation of electric sad iron; closet tank in toilet, first floor, has been relined with sheet lead.

EMPLOYEES' QUARTERS.

Screen porch of main dining room waitresses' quarters has been overhauled and repaired; daylight electric service has been installed in nurses' cottage; new clothes line placed for hospital waitresses' quarters; 2 ironing boards made for main dining room waitresses; key wall socket has been installed for connection to electric heater; linen locker made for main dining room waitresses, and new locks placed on wardrobes; cabinet made for Mrs. Dibble's room; 4 rooms and 3 closets painted and kalsomined in main dining room waitresses' quarters and 1 linen locker stained and 7 chairs and 1 table stained and varnished; 1 canvas curtain painted; three-compartment galvanized iron wash tray made and installed in the hospital waitresses' quarters.

POST STORE.

Three ice cream tables made; new shelving placed; 9 new window sashes made for new addition; floors, counters and new shelving painted; shipping box made for cash register.

"REST" COTTAGE.

In the cottage at Company "C" that was remodelled to be used as a rest room, partitions were placed, walls and ceilings lathed and all interior wood work installed and all painting was done by Home labor.

BARRACKS.

Linen locker made for Company "D"; linen locker made for Company "B"; drawer locks placed on desk in first sergeant's room at Company "E"; new screen made for Company "E"; windows in new bath houses have all been screened; new drain board made for lavatory at Company "B"; slop hopper strainers made for Company "D"; foundations underneath porches at Cottages Nos. 5, 6 and 7, Company "C," having become badly rotted, same were removed and concrete foundations placed; new joists and flooring placed and ventilators were installed.

GENERAL WORK.

Two oak paddles made and floor grating installed in tailor shop; new cleats placed on laundry baskets, window at farmers' residence altered; skiving boards made for harness shop; old tool house at hospital was removed to Sergeant Major's residence and same has been converted into a garage; screen door installed in cabin at vegetable

garden; platform made for band leader's automobile—no new lumber was used for this job; two new window shades placed in Engineer's office; paint strainer made for paint shop; 3 dozen cans for oil and grease samples made for Engineer's department; galvanized iron smoke stacks made for florist's residence and carpenter shop; stove pipe made for cabin at vegetable garden; 2 dozen heads were made for insect sprayers; 2 ventilating pipes made for dry room at laundry to allow for escape of moisture; a zinc-lined shipping box was made, same to be used as required; 6 sign boards made for home grounds; new steam pipe line has been laid from power house to ice plant for engine supply and same has been covered; all fire extinguishers have been overhauled and recharged; concrete catch basin has been installed in sewer line from Company "G" to main sewer line; laundry machinery has caused considerable trouble owing to blankets on mangles being worn out; new side and bridge walls placed for boiler No. 2 and target wall renewed; new governor has been placed on engine at ice plant; engine in machine shop has been overhauled; new hose bibb placed in garden at Chief Surgeon's residence; gear lock on laundry washing machine broke and was replaced by one ordered from San Francisco; boilers Nos. 3 and 4 have been inspected by the State Industrial Accident Commission and favorable report made on same; cement sidewalk to Lincoln Theater was repaired where badly broken, electric pump has been connected up to pump water from pond in front of hospital building to irrigate alfalfa field and berry patch; some trouble has been experienced with pipe line from Rector Canyon and it was found that the wire bands on pipe had become corroded from some cause and burst, allowing pipe to leak badly; other places pipe had several leaks and it was necessary to replace several lengths with new pipe; considerable trouble has been experienced with the sewerage system owing to terra cotta pipes becoming clogged up by roots growing into joints; iron bedsteads at Companies "E" and "G" had old paint removed and repainted and enameled.

CARPENTER SHOP.

One hundred forty-two standard and 1 special size caskets have been made; 15 shipping boxes and 54 new headboards made; carpenter has been at work at hospital all the year doing needed repairing; repairs to buildings, etc., made as needed.

PAINT SHOP.

One hundred forty-three caskets have been stained and varnished; 128 headboards painted and 89 headboards painted and lettered; 61 lights of glass were renewed around camp; repairs were made to furniture, etc., as needed.

ICE PLANT.

One hundred twenty-five tons, 1700 pounds of ice made and delivered, as well as refrigeration for the various cold storages in operation at the Home.

STATE WORK.

"REST" COTTAGE.

Concrete foundations have been placed for underpinning for building; floor joists and sills placed and all plastering done.

MAIN DINING ROOM.

Frame work for two 30-inch Davidson's electric exhaust fans have been placed in north and south ends of main dining room and the fans installed; concrete step has been placed at east entrance; old step was badly rotted and unsafe.

CHAPEL.

All work on this building has been completed and all fixtures installed, altar and pulpit erected, concrete steps placed at entrances; building has been connected with main steam line for heating purposes; chapel is now being used for services.

QUARTERS FOR ASSISTANT SURGEON.

The north wing of the four sanitary cottages at the hospital has been remodelled for use as quarters for Assistant Surgeon of the Home; new wall bed installed as well as additional electric and plumbing fixtures; new galvanized iron wash tray of Home manufacture has been installed; all work has been completed.

TUBERCULAR WARDS.

All work on this building has been completed in accordance with specifications; all plumbing and electric fixtures installed with connections; ladies' toilet has been installed in upper floor of main building; steam table for heating food has been installed; this building has been occupied for some time.

HOSPITAL FOR FEEBLE-MINDED.

This building has been joined together, as it was necessary to cut the building in three parts to move same; all carpenter and painting work has been completed; plumbing and electric fixtures installed and connections made; new steam table for heating food has been installed, porches connecting this building with quarters for inebriates have been erected and building is now being occupied by patients.

QUARTERS FOR INEBRIATES.

All work on this building has been completed with the exception of the installation of heating system, which will be completed in a few days and building will be ready for occupancy.

HOSPITAL KITCHEN AND DINING ROOM.

New addition to hospital dining room has been completed, all fixtures installed and building is now in use; skylight has been placed over main dining room and kitchen and same is giving satisfaction; new steam roaster has been installed in kitchen.

HOSPITAL (GENERAL).

Concrete porch foundations have been placed for porch around kitchen; concrete conduit for refrigerating pipes to hospital has been completed from the end of old conduit to building; pipes have been replaced with cork and asphaltum insulation and concrete cover placed on conduit; concrete floor with cement finish has been placed for hospital laundry; concrete conduits for steam lines to hospital buildings has been run from main at nurses' cottage, pipes laid, and connections made to the different new buildings; pipes have been covered; concrete top placed on conduit and ditch back-filled; water and sewer connections have been made as well; an extension of 300 feet of 4-inch cast-iron water pipe has been added to water main at hospital with one 4-inch hydrant, line to be used as a water supply to new buildings as well as for fire protection; concrete catch basins have been placed in sewer lines from new buildings; drainage ditch has been dug on west side of hospital for feeble-minded; concrete retaining walls have been placed for yard between hospital for feeble-minded and new location of laundry; metal posts set in same and wire fencing placed; hot water heater for hospital dining room has been removed from old location and installed underneath new addition to dining room; new railing has been placed around porch at kitchen; partition between detention room and store room on lower floor of main building has been torn out; cement floor removed, as floor joists were found to be badly rotted; broken plaster has been removed, room relathed and plastered; floor joists and new flooring placed; corner of room has been partitioned off to be used as a lavatory and shower bath; cement floor placed for shower bath; plumbing and electric fixtures installed; room has been painted, all carpenter work completed, and room is now being occupied as a receiving room; a sheet metal sink has been installed in the dining room of the hospital for feeble-minded; carpenters have remodelled one of the lower wards in main building for use as a dressing room; window frames and sash placed, doorway cut for an outside entrance and door



Oaks, Memorial Cottage.

hung; concrete foundations of swill house have been removed so that ground may be graded; the interior walls and ceilings of the four sanitary cottages having become stained are being painted with a washable wall paint and the woodwork and floors have been painted as well.

SURGEON'S RESIDENCE.

Roofing on this building has been removed and same has been replaced with Brooks brand, 3-ply roofing.

GENERAL WORK.

Porch on east side of post store has been enclosed for use as an ice cream parlor, doors placed and screens installed; interior of building has been enlarged, new shelving placed and new flooring laid in new addition; concrete manhole has been placed in sewer line at hospital employees' quarters; cow barn and feeding sheds have been resingled where needed; partitions have been removed in main kitchen making it larger and more sanitary and a screened cupboard has been installed; electrician has connected up motor for electric pump for irrigating alfalfa fields and berry patch in front of hospital; floors in offices in quartermaster's building have been torn out and replaced with new flooring; joists underneath floor in Quartermaster's office were found to be badly rotted and had to be replaced with new joists; place has been excavated underneath floor to provide proper ventilation; new concrete foundations and steps have been placed at Cottages Nos. 5, 6 and 7, Company "C" for porches; as pipe line to Rector Canyon was leaking badly, it was necessary to remove part of same and replace it with new pipe.

Respectfully submitted.

T. W. LAWRENCE,
Chief Engineer.

QUARTERMASTER-COMMISSARY REPORT.

General SAMUEL W. BACKUS, *President, Board of Directors.*

(Through the Commandant.)

SIR: I have the honor to submit herewith the report of the Quartermaster-Commissary for the fiscal year ending June 30, 1919.

This department embraces the farm, chicken and hog ranch, dairy, transportation, laundry, clothing, food and every feature pertaining thereto.

SUPPLIES.

All supplies received during the year were purchased by the State Purchasing Department at Sacramento, California. The quality of the stores have been very good. Samples of foodstuffs are sent to the State Board of Health at Berkeley for analysis, and if found not up to standard are then rejected.

EMPLOYEES.

The departments employ 70 male and 17 female help, both civilian and members. We are now getting a more desirable class of help, owing to the increase of wages in all departments.

The civilian help are badly in need of quarters. In some cases they are of necessity living in Yountville. This arrangement during the rainy season works a hardship. Steps to provide quarters for civilians should be made at once.

WASTE.

Refuse from the kitchens and dining rooms is sent to the hog ranch. Sacks, rubber and scrap iron are sold to the junk men for the best prices obtainable.

KITCHEN.

The food is well cooked and of a very good variety. Our menu shows a very nicely balanced ration for both the older men and the working men, the tables are supplied daily with fresh vegetables and fresh fruit in season.

The funds for the rebuilding of the main kitchen are now available and work will soon be started; this will improve the facilities for caring for and preparing of the food very materially.

BILL OF FARE.

SUNDAY.

Breakfast.

Boston baked beans. Hot
cakes. Baked potatoes.
Bread. Butter. Coffee.

Dinner.

Chicken fricassee. String
beans. Mashed potatoes.
Suet pudding. Bread.
Coffee.

Supper.

Head cheese. Pie. Cheese.
Butter. Bread. Baked
potatoes. Tea. Coffee.

MONDAY.

Breakfast.

Lamb saute. Brown
beans. Corn bread. Butter. Bread.
Bread. Coffee. Mutton
chops.

Dinner.

Roast beef. Steamed
potatoes. Split pea soup.
Coffee. Bread.

Supper.

Oat meal mush and milk.
Butter. Bread. Tea.
Roast beef. Coffee.

TUESDAY.

Breakfast.

Creamed salt salmon.
Corn bread. Butter. Bread.
Coffee. Pork chops.

Dinner.

Roast mutton. Steamed
peeled potatoes. Stewed
carrots. Bread. Coffee.
Indian corn pudding.

Supper.

Macaroni Spanish. Stewed
fruit. Butter. Bread.
Rolls. Tea. Cold meats.
Coffee.

WEDNESDAY.

Breakfast.

Hamburger steak and
onions. Baked potatoes.
Bread. Coffee. Butter.
Mutton chops.

Dinner.

Braised beef. Mashed
potatoes. Bread. Coffee.
Macaroni soup.

Supper.

Mush and milk. Fruit.
Cake. Butter. Bread.
Tea. Roast beef. Coffee.

THURSDAY.

Breakfast.

Hot cakes for mess.
Beef saute and vegetables.
Hot biscuit. Bread.
Coffee. Butter.

Dinner.

Roast beef. Steamed
potatoes. Bread. Coffee.
Rice pudding.

Supper.

Mush and milk. Fruit.
Coffee cake. Butter.
Bread. Tea. Roast
mutton. Coffee.

FRIDAY.

Breakfast.

Creamed codfish. Bread.
Butter. Coffee. Corn
bread.

Dinner.

Baked fresh fish. Stewed
parsnips. Bread. Coffee.
Split pea soup.

Supper.

Macaroni creamed. Biscuit.
Fruit. Bread. Butter.
Tea. Raisin buns.
Roast pork. Coffee.

SATURDAY.

Breakfast.

Pork sausage. Brown
gravy. Corn bread. Butter.
Coffee. Mutton chops.

Dinner.

Braised beef and
vegetables. Steamed
potatoes. String beans.
Bread. Coffee. Potato
soup.

Supper.

Mush and milk. Fruit.
Cake. Butter. Bread.
Tea. Roast beef. Coffee.

Sugar, syrup, mustard, pickles, vinegar and sauces on table at all meals. Fresh vegetables added when received from farm. Fricassee meats for mush tables.

FRUITS.

The orchard has furnished an abundance of fresh fruit during the season; also, a splendid yield of prunes, enough being stored to furnish the institution with all prunes needed until the next crop is available, and a large surplus was sold through the State Purchasing Agent to most of the other state institutions.

FARM.

The feed produced during the year has been especially good, both as to weight and quality.

The soil has been enriched with manure and lime, this being well worked into the ground, and by intensive cultivation the yield has been above the average.

Mr. F. L. Lathrop, the farm expert of the State Board of Control, has given advice that has helped very materially in all branches of the farm work.

DAIRY.

The herd is in splendid condition and except for a few that have been condemned by the State Veterinarian, there are remaining eighty-one head of fine Holstein stock, thirty of which are milk cows, and the remainder, mostly heifers, will soon be old enough to take their place in the milk herd. Now that a milking machine has been allowed, we hope to supply the Home with an abundance of milk in all departments at any season of the year.

CHICKEN RANCH.

This department is doing very good work and getting splendid results from the 5500 white leghorns that supply the Home with the necessary eggs and a great many fricassee dinners for the main mess and the Hospital.

The improvements to the fences and buildings that we hope to make this fall and spring will give a great capacity, and the birds will do even better than in the past, by having more and roomier quarters.

Mr. F. A. Clark is to be given a great deal of credit for his splendid work, and if he and his assistant, Mr. Younger, remain for another year or so, I believe that this institution will have the prize poultry plant of the state.

HOG RANCH.

This drove has supplied the Home with all of the fresh and salt pork and a great deal of the hams and bacon which is cured and smoked by the butcher department.

The present state of health of the animals is very good, although during the spring and early summer the herd was attacked with swine plague, and a number died. The work of inoculating with a mixed vaccine was started as soon as possible, and within a short time the disease was under control.

The foreman, Mr. McCray, is a man of experience in the hog raising business, is very capable and industrious, the pens are kept clean, in good condition, and the feeding of the hogs is carried on in a systematic manner.

VEGETABLE GARDEN.

All vegetables used at the Home are raised in the garden, except the potatoes and part of the onions.

The soil is very rich and the irrigating facilities are all that could be asked for to make a banner yield of good vegetables.

LAUNDRY.

This department has been doing fairly good work, considering the condition of the machinery, which is badly worn, and which the engineering department has constantly been at work on, repairing and patching, and with this aid we have been able to turn out the work on a regular weekly schedule.

I wish to recommend that one civilian be employed that thoroughly understands the work of the washer and separators. We are unable to get such a man from the membership help. Such a man would be of great value to this department, the results would be in getting a better class of work done, with less wear and tear to the clothing, also to the machinery.

The shoe shop has taken care of the repairing of all shoes in a very satisfactory manner.

The work in the harness and mattress shops have been handled by one man, both being run in such a manner that all of this work has been well done with the aid of fatigue help.

The tailor shop has done all of the cleaning and repairing called for in a very satisfactory manner.

The dry cleaning and pressing machinery has been ordered and will soon be installed in the rear of the laundry building.

Respectfully submitted.

F. C. BUTLER,
Captain Quartermaster-Commissary.

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA, JUNE 30, 1919.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Allen, Hiram	A, 8th Wis. Vet. Inf.	Private	20	Michigan	74	\$30 00	Rheumatism	Jan. 26, 1917
Ambrrose, William H. H.	E, 22d Ohio Inf.	Musician	20	Ohio	64	33 00	Nervousness	Jan. 20, 1914
Anderson, John P.	H, 18th U. S. Inf.	Private	119	Denmark	57	8 00	Stomach trouble	June 14, 1919
Anderson, Louis	E, 6th Cal. Inf.	Private	7	Norway	55		Kidney and bladder trouble	April 15, 1914
Amis, Charles H.	F, 2d Mass. Inf.	Private	11	Massachusetts	63	38 00	Defective vision	Aug. 2, 1901
Asnaeck, Henry F.	I, 7th Cal. Inf.	Private	17	Germany	77	35 00	Age; nervousness	Mar. 13, 1917
Armigee, William	H, 3d Pa. H. A.	Musician	17	Maryland	73	35 00	Rheumatism	Mar. 17, 1917
Armstrong, James J.	K, 4th Tex. Vols., etc.	Private	48	Scotland	40	10 00	Heart disease, etc.	Mar. 16, 1904
Arnold, Carl G.	C, 4th U. S. Inf.	Private	36	Germany	73	20 00	Age	Mar. 27, 1919
Ashefelder, Frank M.	U. S. Marine Corps	Private	48	Pennsylvania	32		Lumbago	Sept. 8, 1911
Ashurst, George C.	B, 7th Cal. Inf.	Private	13	Missouri	73	35 00	General debility	June 21, 1915
Atterbury, George B.	G, 18th U. S. Inf.	Private	36	New York	59		Hernia	Oct. 9, 1912
Atterbury, James D.	C, 42d Mo. Inf.	Corporal	11	Missouri	56	32 00	Varicose veins	Sept. 18, 1901
Atwood, Armstrong A.	B, 4th Mich. Cav.	Private	13	Michigan	68	30 00	Bronchial trouble	Mar. 9, 1914
Austin, Charles G.	Bat. A, 1st Battn. Cal. H. A.	Private	16	Ohio	46		Heart disease	April 27, 1908
Bacigalupi, Charles	G, 6th Cal. Inf.	Private	24	Italy	77	40 00	Injury left shoulder	June 7, 1916
Baer, Albert	K, 47th Pa. Inf.	Private	1	Pennsylvania	68		Hernia	Nov. 21, 1914
Baer, Robert E.	A, 1st N. D. Inf.	Private	16	Minnesota	38		Injured back	Oct. 28, 1912
Bailey, George L.	A, 4th N. Y. H. A.	Private	22	New York	66	40 00	Rheumatism; broken ribs	Jan. 6, 1910
Bailey, Washington	G, 2d Ore. Mid. Vols.	Private	3	Missouri	89	20 00	Age	Nov. 9, 1918
Ball, Thomas P.	D, 152d Ind. Inf.	Private	7	Ohio	66	30 00	Rheumatism	July 30, 1914
Baltz, Henry W.	A, 32d Pa. Militia	Private	4	Pennsylvania	62	30 00	Crippled hand and shoulder	April 27, 1905
Barnhardt, Christian M.	I, 172th Ohio Inf.	Private	10	Pennsylvania	49	30 00	Piles	Nov. 19, 1897
Barnhart, James	F, 172d Pa. Inf., etc.	Private	23	Pennsylvania	53	40 00	Gunshot wound rt. breast	July 17, 1897
Barringer, David	M, 2d Mich. Cav.	Private	48	Germany	62	40 00	Lung trouble	Jan. 17, 1906
Barowsky, Henry	C, 169th N. Y. Inf.	Private	5	New York	62	30 00	General debility	June 5, 1909
Barton, James	H, 124th Pa. Inf., etc.	Captain	25	Pennsylvania	74	40 00	Old age	Sept. 22, 1911
Bauer, George S.	M, 1st U. S. Cav., etc.	Sergeant	167	Pennsylvania	65	20 00	Mitral regurgitation	Jan. 8, 1919
Beecher, Miles J.	K, 13th Conn. Inf., etc.	1st Sergeant	53	Connecticut	69	30 00	Paralysis and senility	Jan. 25, 1904
Belk, John C.	D, 14th Kans. Cav.	Sergeant	38	Missouri	63	40 00	Tumor	Oct. 9, 1912
Bel, Charles H.	D, 1st Maine Cav.	Sergeant	46	Maine	51	40 00	Gunshot wound	April 13, 1894
Bel, Daniel	E, 9th Ohio Cav.	Private	22	Canada	69	38 00	Injury to leg	Sept. 21, 1914
Bel, George W.	G, 20th Pa. Inf., etc.	Corporal	26	Pennsylvania	76		Chronic diarrhea	Feb. 22, 1910
Bel, James A.	F, 104th N. Y. Inf.	Private	21	New York	51	38 00	Rupture	Mar. 8, 1893
Belknap, Seba	H, 37th Wis. Inf.	Private	8	New York	67	30 00	Stomach trouble	May 5, 1914
Bennett, William	D, 65th N. Y. Inf.	Private	9	New York	71	19 00	Ulcer right ankle	Sept. 24, 1915

Benton, Addison P.	E, 1424 Ill. Inf.	Private	12	Illinois	63	30 00	Filcs and rupture	Oct. 4, 1911
Beniz, John H.	H, 15th N. Y. Cav.	Private	10	Germany	69	24 00	Paralysis, etc.	July 7, 1916
Bergman, Peter	A, 5th Mo. Cav., etc.	Private	38	Missouri	66	40 00	Rheumatism	Nov. 12, 1909
Bernero, August J.	F, 20th U. S. Inf.	Private	36	Illinois	47		Broken knee	June 8, 1918
Beuler, Julius J.	A, 18th U. S. Inf.	Private	36	Pennsylvania	70	20 00	Age; lameness	May 7, 1917
Billings, Arthur H.	M, 7th Ohio Vol. Inf.	Private	5	Pennsylvania	44		Rheumatism	Jan. 22, 1919
Billings, William H. H.	I, 4th Pa. Res. Inf., etc.	Private	48	Pennsylvania	73	40 00	Cystitis; nervousness	June 25, 1917
Birdsell, John A.	K, 46th Ill. Inf.	Private	7	Canada	59	25 00	Rheumatism; blindness	Mar. 11, 1899
Bittner, Louis	D, 1st Nev. Inf.	Private	39	Germany	43		General debility	July 8, 1907
Black, Charles	F, 7th Pa. Cav., etc.	Captain	23	England	82	40 00	Age; rectal trouble	May 15, 1917
Bliss, Clarence P.	H, 56th Ohio Inf.	Private	13	Ohio	76	35 00	Age	Jan. 16, 1907
Blodgett, Charles E.	H, 18th N. H. Inf.	Private	9	Vermont	64	32 00	Broken right arm	June 25, 1911
Bloomer, Reuben, alias J. S. Bloomer	G, 2d N. Y. Cav.	Corporal	51	New York	75	40 00	Age	Dec. 8, 1915
Blum, Ernest A., alias Wm. Hoffman	I, 14th U. S. Inf.	Private	36	Germany	83		Age	Feb. 5, 1918
Byler, Lewis M.	E, 142d Ind. Inf.	Corporal	10	Indiana	61	32 00	Valvular defect of heart	May 17, 1896
Bockstanz, Charles N.	K, 7th Mich. Inf.	Private	51	France	77	24 00	Short left leg	Nov. 23, 1910
Bohler, Jacob, alias Barth	A, 7th N. Y. Inf.	Private	16	Germany	55	35 00	Old age	July 24, 1897
Boland, Martin	A, 2d Minn. Cav.	Private	24	Illinois	71	40 00	Age and rheumatism	Dec. 31, 1899
Bourquin, August E.	K, 1st Mo. Lt. Art.	Private	36	France	77	40 00	Loss of left leg	Sept. 18, 1917
Bouss, William R.	H, 37th N. J. Inf.	Private	3	New York	56	30 00	Disease of rectum	Dec. 10, 1901
Bowers, Charles	D, 60th Ind. Inf.	Private	36	Indiana	64	40 00	Rheumatism	Oct. 12, 1909
Bowles, John J.	A, 3d Md. Inf.	Corporal	37	Maryland	71	40 00	Age	Sept. 9, 1915
Boyer, Francis	U. S. Navy	Landsman	36	Massachusetts	64	30 00	Rheumatism	Dec. 23, 1917
Boyer, William	U. S. Navy	Ord. Seaman	15	Massachusetts	53	20 00	Blind	Dec. 4, 1898
Boynton, Clyde	E, 2d Ore. Vol. Inf.	Private	16	Illinois	58		Stomach trouble	Mar. 5, 1919
Brady, Edward	I, 56th N. Y. N. G. Inf.	Private	36	Ireland	66	35 00	Rheumatism, etc.	Dec. 30, 1901
Brady, Thomas	U. S. Mil Acad., Art. Det.	Private	5	New York	71	30 00	Disabled arm	Mar. 22, 1917
Brand, Robert	K, 12th Ill. Inf.	Private	36	Canada	75	30 00	Old age; piles	Nov. 13, 1913
Brant, William F.	F, 15th C. S. Inf.	Private	36	Pennsylvania	69	40 00	Loss 3 fingers right hand	June 25, 1911
Bras, Francis	D, 2d Cal. Inf.	Private	16	Holland	66	35 00	Chronic rheumatism	Jan. 7, 1909
Brasher, Robert W.	M, 2d U. S. V. Cav.	Private	6	Nevada	47		Lame both legs and feet	Sept. 7, 1916
Brink, Thomas E.	B, 16th Ill. Inf.	Private	11	Illinois	73	32 00	Sore eyes	Jan. 13, 1907
Brody, Philip	A, 69th N. Y. Inf.	1st Sergeant	27	Ireland	52	32 00	General debility	June 7, 1894
Brosnan, James A.	Bat. A, 1st Batn Cal. H. A.	Private	7	California	49		Hernia	May 4, 1917
Brown, Benjamin	Band, 24th U. S. Inf.	Corporal	34	Missouri	56		Weak eyes	Jan. 12, 1915
Brown, Daniel	F, 1st Cal. Vol. Inf.	Private	15	California	54	12 00	Rheumatism	Sept. 29, 1915
Brown, David B.	B, 23th U. S. Inf.	Private	26	Missouri	40		Lung trouble	Feb. 26, 1918
Brown, Samuel	K, 13th U. S. G. Inf.	Private	9	Georgia	87	32 00	Age	Feb. 5, 1919
Brown, Samuel B.	F, 19th Pa. Inf.	1st Sergeant	30	Pennsylvania	72	40 00	Gunsnot wound	Mar. 21, 1911
Bryan, Edward	U. S. Navy	Master-at-Arms	35	Ireland	67	20 00	Age	Dec. 16, 1910

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length of service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Buchanan, Joseph R.	I, 5th Ill. Inf.	Private	20	Illinois	78	38 00	Age; blind	Jan. 19, 1914
Buckman, Gilbert	L, 1st Vt. Cav.	Bugler	13	Canada	77	35 00	Rheumatism	June 26, 1916
Bullard, William	G, 2d Mass. Cav.	Sergeant	28	England	67	40 00	Lumbago	Feb. 7, 1911
Bundy, William	F, 110th Ind. Inf.	Private	7	Indiana	62	13 50	Stomach trouble	Feb. 6, 1910
Bungard, George	A, 1st Cal. Vol. H. A.	Private	16	Pennsylvania	63		Rheumatism	Feb. 28, 1916
Burchard, Charles	C, 3d R. I. Cav.	Private	23	Rhode Island	70	16 50	Ulcer on nose	Feb. 21, 1916
Burdick, Stephen F.	O, 60th N. Y. Inf.	Corporal	16	New York	67	40 00	Rheumatism; cataracts	Jan. 30, 1906
Burge, Washington B.	U. S. Navy.	Landsmann	16	North Carolina	64	35 00	Rheumatism	Nov. 21, 1901
Burke, Edward J.	F, 1st Mo. Lt. Art.	Private	37	Ireland	71	40 00	Deafness	Oct. 15, 1913
Burke, John	L, 20th N. Y. Cav.	Private	21	Ireland	69	38 00	Rheumatism	Nov. 30, 1914
Butterfield, Fessenden C.	C, 7th Ill. Cav.	Private	12	Maine	69	35 00	Rheumatism	Dec. 6, 1912
Byrod, Frederick W.	C, 21st Pa. Cav.	Private	7	Pennsylvania	67	32 00	Rheumatism	July 12, 1906
Cagney, William	A, 2d U. S. Cav.	Sergeant	36	Ireland	65	20 00	Stomach trouble	Feb. 14, 1910
Callaghan, James W.	L, 9th Ohio Cav.	Private	22	Ohio	69	30 00	Malaria; painters' colic	July 9, 1917
Callaghan, Peter C.	D, 20th U. S. Inf., etc.	Private	60	Connecticut	61	20 00	Rheumatism	Mar. 20, 1911
Cameron, John, No. 2	U. S. Navy.	Oiler	72	Scotland	61		Kidney trouble	Jan. 13, 1914
Campion, William	U. S. Navy.	Ord. Seaman	43	New Jersey	54	40 00	Varicose veins	Oct. 22, 1894
Carels, John H.	E, 82d Pa. Inf.	2d Lieutenant	37	Pennsylvania	81	40 00	Age	April 12, 1912
Carroll, George H.	H, 20th Mass. Inf.	Private	13	Massachusetts	68	24 00	Lung trouble	July 15, 1885
Cart, John	F, 65th N. Y. Inf.	Private	46	Ireland	58	40 00	Injury right shoulder	July 24, 1897
Chalker, William	K, 1st U. S. Inf., etc.	Sergeant	225	New York	61	30 00	Hernia	Dec. 25, 1912
Chambers, James	U. S. Navy.	Seaman	13	Pennsylvania	54	12 00	Loss left arm	Dec. 23, 1893
Charles, Riley	H, 155th Ill. Inf.	Private	7	Illinois	65	15 50	Rheumatism	Oct. 16, 1912
Chatten, George	D, 1st Md. Vol. Inf., etc.	Sergeant	44	New Jersey	44		Partial blindness	July 13, 1918
Chesley, George A.	U. S. Marine Corps.	Private	15	Nebraska	31	24 00	Dislocation right hip	April 20, 1912
Clark, Henry H.	G, 7th Cal. Inf.	Private	20	Michigan	58	33 00	Rheumatism	Dec. 16, 1903
Clark, William D.	H, 17th Ind. Inf.	Private	36	Indiana	75	40 00	Age	Jan. 1, 1918
Clay, William B.	L, 1st Ill. Lt. Art.	Private	17	Kentucky	57	35 00	Loss of voice; frac. rt. arm	Oct. 31, 1901
Clement, Lyman H.	H, 4th Vt. Inf.	Private	7	Vermont	78	32 00	Hernia	July 23, 1918
Clinner, Martin, alias Cubler	C, 3d N. J. Cav.	Private	19	Pennsylvania	57		Hemorrhage of lungs	Jan. 31, 1901
Cole, George E.	E, 4th Mass. Art.	Private	12	Maine	69	32 00	Fracture of leg	June 11, 1915
Collins, William L.	E, 6th U. S. Inf.	Private	36	Illinois	79	40 00	Malaria	July 7, 1914
Colton, Nathaniel W.	F, 10th Mass. Inf.	Private	17	Massachusetts	55	35 00	General debility	Sept. 9, 1893
Conaty, Andrew M.	L, 14th Ill. Inf.	Private	78	England	40 00		Age	Sept. 5, 1917
Connolly, Joseph P.	B, 4th U. S. V. Inf.	Corporal	12	Ireland	56		Rupture	Sept. 6, 1912

Connors, John W	M, 1st Wash. Vol. Inf.	3	California	42	Tuberculosis	May 15, 1912
Conroy, Richard	C, 9th Ind. Inf.	21	New York	67	Rheumatism	Sept. 27, 1910
Cook, George B.	A, 60th Mass. Inf.	36	Massachusetts	59	Epilepsy	May 10, 1903
Cook, Peter	D, 7th Cal. Inf.	74	Germany	35	Impaired vision; age	Dec. 17, 1905
Cooley, Jonathan L.	F, 6th Tenn. Cav.	14	Tennessee	49	Gunshot wound right thigh	Dec. 5, 1884
Corbett, John	U. S. Marine Corps.	60	Ireland	47	Broken hip	Oct. 28, 1909
Corrigan, William	G, 4th Cal. Inf.	36	Ireland	73	Stomach trouble	Aug. 9, 1913
Court, Ernest	B, 10th U. S. Inf.	36	Missouri	43	Ataxia both legs	May 15, 1919
Cowen, John Q.	E, 142d Ill. Inf., etc.	10	Illinois	66	Crippled hand	Oct. 3, 1910
Cox, George W.	L, 2d Neb. Cav.	9	Missouri	71	Age	April 29, 1918
Coyne, James A.	I, 2d La. Inf.	4	Louisiana	68	Neurosthenia	Aug. 2, 1912
Crane, Edward	C, 76th Ill. Inf.	35	Illinois	63	Broken right arm	Nov. 5, 1914
Crawford, James L.	E, 9th U. S. Inf.	54	New York	64	Kidney trouble; rheumatism	Nov. 12, 1917
Crawley, Jasper	B, 33d Ind. Inf.	36	Indiana	81	Weakness of age	June 5, 1919
Crossett, George T.	U. S. Navy.	17	California	35	General tuberculosis	Sept. 4, 1915
Cummings, Charles W.	F, 1st Mass. Cav.	21	New Hampshire	76	Age	Aug. 22, 1917
Cummings, William	12th, Mass. Lt. Batt.	31	Maine	60	Rupture	Dec. 17, 1904
Cunard, James H.	L, 7th Cal. Inf.	17	Pennsylvania	81	Age	Jan. 18, 1918
Curtin, John	E, 9th U. S. Inf.	76	Ireland	69	Rheumatism	July 17, 1910
Curtis, Francis A.	I, 1st Neb. Cav.	18	Pennsylvania	65	Rheumatism	Sept. 27, 1910
Cushing, John	U. S. Navy.	12	New York	66	Rheumatism	April 4, 1912
Cushing, Nathaniel	K, 4th Mass. Cav.	33	Massachusetts	50	General debility	Nov. 29, 1877
Dace, John	C, 151st Ill. Inf.	11	Missouri	66	Partial paralysis right arm	Jan. 13, 1915
Dally, Edward	F, 1st U. S. Inf., etc.	36	Ireland	32	Malaria; stomach trouble	Jan. 14, 1908
Daley, Thomas J.	F, 1st Cal. Vol. Inf.	15	California	44	Dysentery	Jan. 24, 1913
Daniels, Charles	M, 49th U. S. V. Inf.	20	North Carolina	45	Locomotor ataxia	Feb. 4, 1918
Daum, Henry	B, 24th N.Y. Inf.	31	Germany	60	Injury right hip	Oct. 22, 1897
Davis, Calvin L.	K, 16th U. S. Inf.	39	New York	36	Kidney trouble	Mar. 20, 1914
Davis, George Alfred	G, 60th Mass. Inf., etc.	69	Vermont	69	Rheumatism	Dec. 1, 1913
Davis, Preston R.	C, 129th Ohio Inf.	57	Ohio	57	Scurvy	Dec. 13, 1899
Dawson, Thomas	E, 5th U. S. Cav.	73	England	73	Rheumatism	Feb. 8, 1917
Dean, Charles F.	A, 13th U. S. Inf.	37	Ohio	67	Rupture and general debility	Sept. 26, 1914
Dean, Warren B.	D, 101st Pa. Inf.	3	Pennsylvania	68	Age	Mar. 23, 1915
Deatherage, Harry E.	A, 1st Nev. Vol. Cav.	16	Tennessee	60	Partial deafness	Nov. 8, 1918
de Jarnac, Edmund	Band, 8th U. S. Inf.	120	France	67	Varicose veins	July 12, 1914
Delaney, Francis, alias Riley	U. S. Navy.	12	Ireland	65	Rheumatism	Dec. 16, 1910
Deveney, John	B, 30th U. S. Inf.	36	Ireland	67	Rheumatism	Mar. 2, 1909
Dickerson, George M.	D, 2d U. S. Lt. Art.	37	New York	73	Age	Nov. 21, 1916
Dickey, Herbert V.	B, 22d Maine Inf.	10	Maine	66	Rheumatism	Sept. 21, 1911
Dickson, William	D, 9th U. S. Vet. Vols.	49	Scotland	70	Rheumatism	April 13, 1907
Diehl, John A.	E, 51st Ohio Inf., etc.	10	Ohio	75	General debility	June 15, 1911

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when ad- mitted	Pen- sion per month	Disability	When admitted
Dings, James M.	U. S. Navy	Seaman	18	New York	75	24 00	Rheumatism	June 11, 1916
Dirks, Henry	B. 1st Batn. N. Cal. Cav.	1st Sergeant	25	Germany	77	40 00	Paralysis	June 11, 1916
Dixon, Frank J.	C. 32d U. S. Inf., etc.	Private	37	England	63		Asthma	Mar. 2, 1905
Dodd, James	U. S. Navy	Landman	39	Massachusetts	50	38 00	Rheumatism	June 4, 1891
Dolan, Patrick	A. 5th U. S. Cav.	Private	36	Ireland	56	40 00	General debility	Nov. 19, 1894
Donlon, Dennis G.	U. S. Navy	Ord. Seaman	10	Ireland	63	30 00	Lumbago	Dec. 13, 1910
Dooley, Daniel C.	C. 11th U. S. Inf., etc.	Sergeant	82	Ireland	49		Blood poisoning	Sept. 2, 1911
Dority, Henry W.	Unassd. 19th Me. Inf.	Private	2	Maine	49		Blind	Dec. 2, 1895
Douglass, Robert A.	H. 6th Cal. Inf.	Private	31	New York	58	40 00	Rupture; piles	July 11, 1900
Doyle, John	H. 36th U. S. Inf.	Private	18	New York	49	6 00	Malaria	Mar. 7, 1907
Draper, Thomas D.	H. 4th Cal. Inf.	Private	36	New York	65		General debility	May 14, 1899
Drummond, Benjamin	D. 7th Cal. Inf.	Private	19	Illinois	62	30 00	Rheumatism	Dec. 15, 1909
Duff, Hugh M.	K. 7th U. S. Inf., etc.	Private	64	Ireland	46	6 00	Rheumatism	Nov. 27, 1911
Duffy, Charles, alias Thomas Rinn	C. 1st U. S. Cav.	Sergeant	60	Connecticut	60	30 00	Rheumatism	Oct. 3, 1914
Duncan, George M.	G. 1st Wash. Vol. Inf.	Private	17	California	33	17 00	Loss right arm	July 27, 1911
Dunn, Michael C., alias Joseph Smith	U. S. Navy	Landman	25	Louisiana	65	40 00	Broken ribs	Mar. 11, 1902
Durney, James N.	6th Bat 1st Batn Me Lt. A.	Private	31	Maine	72	40 00	Blindness	Jan. 21, 1916
Dushane, Jesse P.	K. 100th Pa. Inf.	Private	32	Pennsylvania	74	40 00	Age	April 15, 1916
Dwyer, Michael	H. 4th Cal. Inf.	Private	20	Ireland	68	38 00	Rheumatism	June 1, 1905
Dwyer, Patrick	F. 1st U. S. Inf.	Private	59	Ireland	54	12 00	Crippled right leg	April 6, 1914
Dyer, Joseph D.	U. S. Navy	Seaman	51	Ireland	55	38 00	Kidney disease	May 15, 1899
Edgerly, Richard	D. 7th Me. Inf.	Private	8	Maine	75		Age	June 23, 1916
Edwards, Shepard D.	C. 7th Me. H. A.	Private	24	Maine	72	40 00	Injury to back	April 23, 1918
Eichelberger, John C.	H. 2d Iowa Inf.	Sergeant	36	Pennsylvania	54	40 00	Rheumatism	May 3, 1892
Ellingsworth, Samuel	G. 23d Pa. Inf.	Private	26	Pennsylvania	78	38 00	Double hernia, etc.	June 9, 1919
Elliott, Henry	M. 1st U. S. V. Cav.	Private	18	Maryland	57		Asthma, etc.	June 5, 1916
Elliott, John J.	E. 12th Ky. Inf.	Private	30	Kentucky	73	40 00	Age	Oct. 13, 1916
Estabrook, William W.	B. 1st Nev. Inf.	Private	22	New Hampshire	47	38 00	Rheumatism	Aug. 23, 1901
Evans, John W.	U. S. Navy	Carpenter's Mate	34	New York	47		Deafness	July 18, 1911
Evarts, Aranthus	B. 8th Ill. Cav.	Private	7	Iowa	60	32 00	Rheumatism	Dec. 23, 1904
Fahy, Michael	C. 7th U. S. Inf.	Private	34	Ireland	75		Rupture	May 8, 1914
Faithful, Edwin	U. S. Navy	Seaman	19	England	84	38 00	Age; rheumatism	Nov. 7, 1917
Fales, Charles E.	K. 9th N. Y. Inf.	Private	71	Maryland	51		Deafness	July 8, 1915
Farnsworth, John H.	A. 15th U. S. Inf.	Private	7	Missouri	42	6 00	Abscess of appendix	June 18, 1915

Fenton, George W.	H, 16th Ill. Inf.	Private	34	Vermont	77	40 00	Age; partial paralysis	June 7, 1919
Ferchland, Charles	I, 1st Cal. Inf.	Private	15	Germany	57		Bronchitis	Aug. 16, 1912
Ferers, Eugene	Casual Coast Art.	Private	36	Italy	43		Tuberculosis	Oct. 9, 1912
Fernald, Thomas C.	E, 9th Minn. Inf.	Musical	3	Massachusetts	65	30 00	Injury of shoulder	Sept. 16, 1914
Ferree, Samuel	G, 31st U. S. V. Inf.	Private	20	Kentucky	53		Rheumatism	Feb. 5, 1919
Fields, Anthony	D, 1st Maine Inf.	Private	39	Maine	74	40 00	Paralysis	May 28, 1919
Flimer, Edmund L.	B, 1st Cal. Vol. Inf.	Private	14	Massachusetts	49		Malaria	Dec. 6, 1918
Flood, James	B, 8th Mass. Vol. Mil.	Private	4	New York	71	30 00	Gunshot wound rt. arm	Sept. 13, 1915
Flynn, Edmund W.	I, 5th Wis. Inf.	Private	39	New York	55	40 00	Age	July 6, 1894
Follett, Thomas M.	H, 3rd Iowa Inf.	Corporal	36	Canada	72	40 00	Age	April 22, 1907
Fonda, Abner S.	A, 7th Vermont Inf.	1st Lt. and Q.M.	51	Vermont	69	40 00	Bronchitis; hernia	Mar. 15, 1910
Foster, Andrew H.	F, 1st Mich. Lt. Art.	Private	18	New York	69	38 00	Cough	Sept. 9, 1912
Foster, Charles E.	M, 14th U. S. Inf.	Private	36	Kansas	50		Sore feet	July 7, 1916
Fowler, Martin	G, 1st Wash. Vol. Inf.	Private	16	Kentucky	60		Lumbago	July 8, 1915
Foy, Edwin B.	K, 20th Maine Inf., etc.	Corporal	39	Maine	56	40 00	Loss of right foot	Nov. 19, 1910
Franks, John	M, 1st Cal. Cav.	Corporal	37	Tennessee	77	40 00	Age; defective vision	July 21, 1910
Freder, Thomas J.	K, 15th Ohio Inf.	Private	3	Ohio	74	18 00	General debility	July 11, 1906
Frear, Chauncey E.	L, 6th N. Y. Hvy. Art.	Private	24	New York	54	40 00	Rheumatism	April 22, 1893
Fuchs, Herman	A, 1st Idaho Vol. Inf.	Private	16	Austria	59		Sprained back	July 1, 1913
Gallagher, James	U. S. Navy	Seaman	36	New York	80	35 00	Old age	May 18, 1912
Gallagher, John F.	G, 14th U. S. Inf.	Private	25	Massachusetts	43		Neuralgia	Sept. 29, 1910
Gallagher, Thomas	F, 33rd U. S. V. Inf.	Private	21	Massachusetts	47		Tuberculosis	Dec. 16, 1910
Galloway, Joseph McCain	K, 15th N. Y. Cav.	Private	18	Ireland	52	40 00	Deafness	Oct. 6, 1897
Gardner, Jacob W.	E, 8th Maine Inf.	Private	15	New York	64	35 00	Rheumatism	Mar. 24, 1904
Gardner, William	K, 11th Maine Inf.	Corporal	10	Maine	73	32 00	Stomach trouble	Jan. 10, 1915
Gassett, Charles	K, 1st Mo. S. M. Cav., etc.	Private	29	Kentucky	76	40 00	Age	Nov. 15, 1918
Gehring, Erhard	F, 13th N. Y. State Mil.	Private	4	New York	69	30 00	Rheumatism	July 1, 1915
George, William H.	C, 30th N. J. Vol. Inf.	Private	22	Switzerland	74	38 00	Dropsy	April 19, 1913
Geran, Anthony, Jr.	24th Ky Inf.	Q. M. Sergt.	40	Kentucky	78	40 00	Age	Jan. 9, 1918
Gibbs, William	E, 4th Cal. Inf.	Private	41	California	45	30 00	Rheumatism	Dec. 18, 1883
Gibson, John F.	K, 7th U. S. Cav.	Private	46	England	62	20 00	Nephritis	Jan. 11, 1910
Gilbert, Horace B.	G, 8th Mich. Inf., etc.	Private	37	Michigan	76	40 00	Rheumatism, etc.	June 25, 1919
Gillespie, George W.	F, 30th N. Y. Inf.	Sergeant	48	New York	66	40 00	Blindness	June 13, 1907
Gilooly, William F.	I, 102d Pa. Inf.	2d Lieut.	46	Pennsylvania	68	40 00	Rheumatism	June 27, 1913
Gingher, John T.	L, 7th U. S. Inf.	Corporal	33	Ireland	61		Hernia	Mar. 21, 1918
Ginnety, James	I, 9th Pa. Cav.	Private	14	Pennsylvania	71	38 00	Rheumatism	Sept. 23, 1911
Glass, Julius R.	D, 17th Wis. Inf.	Private	44	Ireland	50	40 00	Rheumatism	Dec. 8, 1892
Gleason, James	U. S. Navy	1st cl. musician	60	Germany	55		Asthma, etc.	Mar. 26, 1919
Goodhart, Lewis	U. S. Navy	Land sergeant	9	Massachusetts	48	12 00	La Grippe	Dec. 12, 1918
Goodman, George R.	F, 16th U. S. Inf.	Sergeant	60	Pennsylvania	52		Rheumatism, sprain in back	Oct. 7, 1914
Gowan, Thomas	K, 25th Mo. Inf., etc.	Private	18	Kentucky	60	6 00	General debility	Oct. 13, 1897
	F, 21st U. S. Inf.	Private	36	Connecticut	70		General debility	Nov. 13, 1916

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when ad- mitted	Pen- sion per month	Disability	When admitted
Graham, Andrew J.	U. S. Navy.	Qr. Gun. mate.	37	Pennsylvania	58	30 00	Partial paralysis	Sept. 28, 1892
Graham, Richard A.	U. S. Navy.	Seaman	42	England	61	38 00	Asthma	Oct. 22, 1901
Graham, William	I, 58th Mass. Inf.	Private	17	Ireland	50	35 00	Valvular heart disease.	Oct. 16, 1901
Green, Edward J.	E, 1st Cal. Vol. Inf.	Private	12	New York	38		Rheumatism	Oct. 23, 1914
Green, William H.	K, 6th Cal. Inf.	Corporal	11	Massachusetts	82	32 00	Age	June 6, 1919
Griffin, Stockton L.	A, 14th Ill. Inf.	Private	37	Ohio	78	40 00	Age	Oct. 5, 1913
Grimes, John L.	U. S. Navy.	Blacksmith	70	California	43		Hernia	Jan. 3, 1912
Grogan, Thomas C.	Asst. Hosp. St.	Asst. Hosp. St.	12	Virginia	54		Rheumatism	Nov. 4, 1914
Grow, Ambrose	B, 1st Nat. Cal. Cav.	Private	16	Indiana	67	40 00	Rheumatism	Oct. 13, 1909
Haganan, Abraham J.	I, 2d Vet. N. Y. Cav.	Private	25	New York	58	30 00	Rheumatism	April 27, 1903
Hagenow, Robert	D, 6th U. S. Cav.	Private	39	Denmark	57		Rheumatism	Feb. 12, 1918
Hagerly, John	K, 8th Pa. Cav.	Private	2	Ireland	83		Old age	May 16, 1913
Haggerty, Michael	G, 9th Mass. Inf.	Private	36	Ireland	72	40 00	Age	May 12, 1914
Haldkier, James	U. S. Navy.	1st cl. fireman.	29	Denmark	65	40 00	Broken ribs	May 26, 1908
Hall, Henry	E, 8th Pa. Inf.	Private	18	Vermont	71	38 00	General debility	Aug. 15, 1898
Hall, Lester E.	G, 115th Ohio Inf.	Private	10	Ohio	59	35 00	Bronchitis	Oct. 4, 1903
Hamilton, John	U. S. Navy.	Landsman	3	Ireland	68	30 00	Rheumatism	Sept. 27, 1912
Hamilton, Thomas F.	I, 73d Ohio Inf.	1st Lieut.	46	Ohio	67	40 00	General debility	Nov. 9, 1905
Hammond, Abram	I, 1st Tenn. Cav.	Major	15	Virginia	87	24 00	Rupture	Nov. 3, 1913
Hanley, Michael	A, 6th U. S. Inf.	Private	36	Ireland	43		Piles	Jan. 3, 1913
Hansson, Martin	U. S. Navy.	Ord. Seaman.	105	Sweden	42	8 00	Rheumatism	Feb. 26, 1911
Harkness, Oscar L.	K, 78th Ill. Inf.	Private	33	Illinois	65	40 00	Rheumatism	Dec. 17, 1909
Harney, Robert	A, 62d Mass. Inf.	Private	1	Massachusetts	62		Sore leg	July 4, 1913
Hardie, Robert F.	F, 22d U. S. Inf.	Private	36	New York	45		Nephritis	April 17, 1914
Harrington, Jeremiah	E, Battn. U. S. Engrs., etc.	Private	72	Ireland	46		Loss of foot, falling vision.	Mar. 14, 1919
Harris, Andrew C.	C, 17th Ind. Inf., etc.	Private	18	Indiana	72	38 00	Age; general debility	June 26, 1919
Harris, George	M, 5th N. Y. Hwy. Art.	Private	15	Ireland	71	35 00	Rheumatism	Oct. 9, 1912
Hart, Jesse B.	A, 56th Ohio Inf.	Private	20	Ohio	68	30 00	Partial paralysis rt. hand	June 16, 1914
Harvey, John R.	G, 14th U. S. Inf.	Private	15	Pennsylvania	33		Stomach trouble	June 11, 1906
Haskins, Charles	D, 8th N. Y. Inf.	Private	38	New York	69	40 00	Rheumatism	May 1, 1913
Hastie, Gavin S.	K, 2d U. S. Art.	Musician	60	New York	43	30 00	Heart disease	Feb. 9, 1895
Hatherly, William	H, 1st U. S. Vol. Engrs.	Private	11	England	68	32 00	Rheumatism	Oct. 13, 1915
Hawes, Silas M.	I, 33d U. S. V. Inf.	Private	20	Argentine Rep.	53		Itch	Feb. 2, 1914
Hayes, Frank P.	L, 1st U. S. V. Cav.	2d Lieut.	4	Canada	42		Dysentery; malaria	May 20, 1909
Hayes, Hugh	I, 7th Vermont Inf.	Private	4	Ireland	55	30 00	Asthma	Nov. 25, 1897
Hayes, James	E, 1st Maine Cav.	Private	37	New Brunswick	62	40 00	Dyspepsia	Nov. 10, 1901

Heales, John	B, 6th Wis. Inf.	Private	42	England	79	40 00	Age	June 10, 1915
Heath, Leon D.	A, 7th Cal. Inf.	Private	18	Illinois	68	30 00	Rheumatism	Nov. 18, 1905
Henry, Allen	F, 3d Colo. Cav.	Private	4	Ohio	70	30 70	Age	Sept. 24, 1915
Herrick, Philip	K, 13th Ohio Cav., etc.	Private	6	France	67	30 00	Deafness	Nov. 3, 1911
Hickerson, William	K, 13th Ill. Cav.	Private	20	Kentucky	68	30 00	Prostate glands	Oct. 22, 1914
Higgins, John W.	K, 175th Ohio Inf., etc.	Private	11	Ohio	64	32 00	Dropsy	Mar. 26, 1911
Hildebrand, James O.	D, 1st Pa. Cav.	Private	16	Pennsylvania	57	35 00	Rheumatism	Dec. 24, 1901
Hill, Erwin D.	C, 14th Ohio Cav.	Trumpeter	6	Ohio	59	32 00	Rheumatism	April 7, 1902
Hills, Henry H.	I, 2d Minn. Inf.	2d Lieut.	47	Illinois	69	40 00	Catarrh, stomach and throat	Sept. 24, 1910
Hinden, Valentine	K, 14th U. S. Inf., etc.	Private	36	France	63	32 00	Rheumatism	Oct. 1, 1909
Hipple, Henry H.	A, 130th Pa. Inf.	Musician	10	Pennsylvania	60	32 00	Heart disease	July 7, 1905
Hitecock, James W.	A, 42d Mo. Inf.	Private	13	New York	59	32 00	Age; nervousness	Oct. 21, 1899
Hollenwager, Louis	K, 26th Ohio Inf.	Private	51	Germany	76	40 00	Piles	Sept. 10, 1911
Holmes, Charles A.	H, 9th U. S. Inf.	Private	41	New Brunswick	47	12 00	Sclerosis	Dec. 12, 1908
Holt, David	F, 8th Cal. Inf.	2d Lieut.	31	Maine	61	40 00	Chronic diarrhoea	Oct. 21, 1904
Hood, Edward P.	F, 2d Cal. Inf.	Private	33	New Hampshire	56	40 00	Rupture	Sept. 19, 1896
Hoogs, Charles R.	K, 80th Ohio Inf.	Private	43	Massachusetts	67	40 00	Rheumatism	May 11, 1910
Hosford, Henry H.	L, 2d U. S. V. Engrs.	1st cl. Private	63	Indiana	63	30 00	Physical weakness	Nov. 21, 1917
Hough, George H.	H, 33th U. S. V. Inf.	Private	2	California	52	30 00	General debility	Mar. 15, 1916
Hubbard, James L.	D, 6th Mo. Vol. Inf.	Private	46	Indiana	45	40 00	Gastritis; throat trouble	Sept. 11, 1917
Hubbard, John N.	Band, 10th Ind. Inf.	Prtn. Musician	36	Indiana	71	40 00	Rheumatism	July 15, 1911
Higgins, Harrison Y.	L, 2d Pa. Hvy. Art.	Corporal	35	New Jersey	71	40 00	Gunshot wound left arm	Aug. 17, 1911
Hughes, Charles	U. S. Navy	2d cl. Mach.	22	England	48	30 00	Asthma	Aug. 10, 1914
Hugoboom, Fred	A, 5th U. S. Cav.	Private	9	New York	60	30 00	Laure lock	Oct. 22, 1916
Hunter, John D.	B, 79th N. Y. Inf.	Musician	36	Scotland	71	40 00	Rheumatism	Aug. 11, 1911
Hunter, William	B, 188th Pa. Inf.	Musician	15	Pennsylvania	72	40 00	Rheumatism; paralysis	May 11, 1917
Huntington, Robert	U. S. Marine Corps.	Private	60	Massachusetts	52	17 00	Malaria	June 26, 1917
Huntton, George B.	K, 32d U. S. V. Inf.	Private	20	Virginia	51	30 00	General debility	April 11, 1917
Hyde, Harvey	U. S. Navy	1st cl. Boy	25	New York	66	30 00	Age	Oct. 10, 1915
Hynes, John A.	I, 17th Ill. Cav.	1st Lt and Adjt.	18	Wisconsin	50	38 00	Loss of 3 fingers	Oct. 19, 1893
Iser, Arthur M.	H, 12th U. S. Inf.	Private	21	Pennsylvania	66	12 00	Rheumatism	May 27, 1914
Isham, Alfred W.	F, 13th Vermont Inf.	Private	12	Vermont	60	32 00	Lumbago	Jan. 11, 1901
Jackson, Thomas	G, 1st U. S. Art., etc.	Private	94	Canada	59	40 00	Broken hip	June 30, 1890
Jenkins, Roy E.	H, U. S. Signal Corps.	Private	36	Maryland	46	40 00	Hernia	May 12, 1915
Jessup, Henry C.	D, 145th Pa. Inf.	Sergeant	33	Pennsylvania	70	40 00	General debility	April 5, 1909
Jewett, Loring A.	I, 32d Mass. Inf.	Private	34	Maine	58	40 00	Age	Mar. 16, 1900
Jockers, Charles	D, 1st Iowa Inf.	Private	3	Germany	59	39 00	Injury to leg	Nov. 28, 1893
Johnson, Richard	B, 23d Mo. Inf.	Private	32	Ohio	68	40 00	Varicose veins	Feb. 16, 1915
Jones, Edwin	C, 5th U. S. Art.	Private	37	Pennsylvania	54	40 00	Gunshot wound	April 12, 1888
Jones, George	G, 1st U. S. Inf., etc.	Sergeant	144	England	43	10 00	Myocarditis	July 23, 1912

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when ad- mitted	Pen- sion per month	Disability	When admitted
Jones, James T.	G, 41st Ill. Inf.	Private	35	Illinois	70	40 00	Chills and fever.	July 6, 1916
Jones, John P.	C, 73d Ill. Inf.	Private	35	Illinois	69	40 00	Heart trouble	July 13, 1914
Jones, Morgan	L, 1st Pa. Vol. Inf., etc.	Private	41	England	56	6 00	Loss index finger rt. hand	Dec. 13, 1916
Josselyn, Joseph H., Jr.	C, 2d Cal. Inf.	Corporal	17	Massachusetts	63	35 00	Rheumatism	Sept. 27, 1909
Kaiting, James	K, 4th Cal. Inf.	Private	14	Ireland	60	24 00	Chronic bronchitis	Mar. 17, 1895
Kane, Bernard	K, 16th Ill. Inf.	Private	36	Ireland	75	40 00	Catarth; rheumatism	Aug. 7, 1908
Kane, Hugh	A, 9th Mich. Cav.	Private	15	Ireland	65	22 50	Lumbago	Feb. 14, 1904
Karr, William	B, 9th Mich. Cav.	Private	21	Pennsylvania	73	27 00	Old age	May 8, 1911
Kaufman, Charles, alias Chas. Merchant	M, 10th N. Y. Cav.	Private	7	Germany	72	32 00	Nervous prostration	July 8, 1913
Kearney, Washington I.	K, 91st N. Y. Inf.	Private	10	New York	65	32 00	Rheumatism; inelap. paralysis	June 7, 1911
Kearney, Matthew	H, 2d U. S. Cav.	Private	60	Ireland	67	20 00	Rheumatism	Nov. 8, 1918
Kelly, Edward	A, 3d Cal. Inf.	Private	36	Illinois	56	40 00	Asthma	Jan. 20, 1897
Kennedy, Michael A.	F, 14th U. S. Inf.	Private	13	Ohio	37	17 00	Gunshot wound	Mar. 3, 1912
Kershner, Rufus	B, 195th Ohio Inf.	Private	54	Ohio	78	32 00	Age; rheumatism; poor vision	Sept. 22, 1917
Kidder, John W.	D, 3d Wis. Vols.	Private	26	Wisconsin	72	40 00	Age	Dec. 8, 1915
Kimble, Garrett	F, 2d N. Y. Inf., etc.	Private	27	New Jersey	68	40 00	Rheumatism	Oct. 6, 1910
King, George R.	D, 4th Wis. Inf.	Private	43	Wisconsin	48	40 00	Constipation	Dec. 27, 1895
Kingman, Albert E.	K, 27th N. Y. Inf., etc.	Private	43	New York	70	40 00	Age	May 1, 1913
Kitchen, Walter S.	G, 42d Mass. Art., etc.	Corporal	133	Massachusetts	72	40 00	Rheumatism	Aug. 26, 1907
Knapp, Orris	A, 3d Colo. Cav.	Sergeant	4	Massachusetts	84	30 00	Age	Nov. 15, 1916
Knickmeyer, William	I, 1st Mo. Art.	Private	36	Germany	64	40 00	Heart disease	May 26, 1904
Knight, Robert	H, 10th R. I. Inf.	Private	3	Rhode Island	72	30 00	Deafness	Sept. 25, 1917
Kubel, Gustave	M, 3d N. Y. Cav., etc.	Private	56	Germany	75	38 00	Loss of leg; asthma	April 16, 1919
Lacy, Al. F.	F, 22d Kans. Vol. Inf.	Private	4	Kansas	49		Stomach trouble	Mar. 11, 1919
Lafayette, Alfred A.	C, 8. Marine Corps	Private	60	California	39		Partial paralysis	June 6, 1919
Lafferty, John L.	F, 2d Ore. Vol. Inf.	Private	13	California	48		Loss of left leg	Feb. 15, 1915
Lamb, Henry E.	G, 35th Wis. Inf.	Private	26	Wisconsin	67	40 00	Heart trouble	Mar. 9, 1913
Lamb, Henry S.	C, 42d Wis. Inf.	Corporal	10	Ohio	71	32 00	Scallity; bronchitis, etc.	June 19, 1914
Lane, William	U. S. Navy	Ord. Seaman	12	England	76	35 00	Age	April 12, 1917
Lang, Joseph	F, 8th Cal. Vol. Inf.	Private	7	Indiana	51		Injury to hip	Mar. 19, 1914
Larish, Henry	E, 21st Ill. Inf.	Private	10	Pennsylvania	54	32 00	Rheumatism	Oct. 7, 1894
Laughon, Lee N.	E, 5th Maine Inf.	Private	11	Maine	77	32 00	Old injury to knee cap; age	Mar. 16, 1919
Lavozy, Frank A.	K and E, 1st U. S. Art.	Sergeant	239	New Hampshire	68	20 00	Paralysis	May 27, 1919
Lawrence, Demarquis L.	K, 22d Maine Inf.	Private	11	Maine	82	32 00	Age	July 19, 1915

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension ad- per month	Disability	When admitted
Mackin, John	U. S. Navy	Sailmks. mate	25	Ireland	59	---	Deafness	Oct. 10, 1914
Madigan, Andrew J.	K. 73d N. Y. Inf.	Private	36	Ireland	65	---	G. S. W. left leg	July 14, 1900
Magee, John	U. S. Marine Corps	Private	22	Ireland	65	35 00	Partial paralysis	Nov. 20, 1907
Maguire, Thomas	D. 46th N. Y. Inf.	Private	5	Ireland	46	15 00	Disease of rectum	Aug. 6, 1892
Mahon, Joseph	A. 2d Mass. H. A.	Private	23	Massachusetts	50	38 00	Lumbago	Dec. 3, 1896
Maheony, James	A. 2d Maine Cav.	Private	9	Canada	68	32 00	Effects pneumonia	Oct. 7, 1911
Mahr, Philip J.	C. 1st Conn. Vol. Inf.	Sergeant	42	Germany	39	---	Tuberculosis	Feb. 14, 1919
Malley, William	G. 8th Cal. Inf.	Private	11	Ireland	68	32 00	Deafness	Mar. 17, 1907
Manning, Patrick	U. S. Navy	2d cl. Fireman	3	Pennsylvania	53	---	Broken left leg	May 21, 1908
Manz, Aaron	H. 1st Wash. Inf.	Private	33	Germany	78	40 00	Age	May 15, 1915
Markham, John H.	K. 1st Cal. Vol. Inf.	Corporal	18	Ireland	54	---	Hernia	June 11, 1919
Markus, Ellison	F. 143d Ind. Inf.	Private	10	Indiana	61	32 00	Rheumatism	June 6, 1909
Marshall, Joseph P.	F. 1st Cal. Vol. Inf.	Corporal	16	California	43	6 00	Pulmonary tuberculosis	June 21, 1919
Martin, Henry	U. S. Navy	Landsman	9	England	64	32 00	Heart disease	Feb. 15, 1906
Mason, Charles M.	H. 30th Maine Inf.	Private	20	Maine	59	38 00	Rheumatism, etc.	Oct. 10, 1903
Mathews, Robert F.	U. S. Navy	Landsman	139	Maryland	51	---	Rheumatism	Feb. 11, 1919
Mathies, Robert F.	U. S. Navy	Seaman	37	Wales	53	40 00	Injury from burns	July 30, 1891
Maurice, James	U. S. Navy	Private	36	Ireland	69	40 00	Senility	Dec. 31, 1902
Meehan, Thomas	H. 6th Pa. Cav.	Private	28	Virginia	72	40 00	Chronic bronchitis	April 28, 1904
Meer, John	L. 1st Cal. Cav.	Private	34	Maine	60	40 00	Rheumatism	Sept. 29, 1910
Merrill, John E.	K. 8th Maine Inf.	Private	23	Austria	40	12 00	Gastritis, dysentery	April 11, 1912
Mesner, John	C. 7th U. S. Inf.	Private	44	Ohio	74	40 00	Age	Feb. 1, 1917
Metzger, Samuel W.	M. 2d Wis. Cav.	Corporal	6	Indiana	68	30 00	Age	April 6, 1915
Metzger, Alfred	I. 155 Ind. Inf.	Private	7	Germany	56	---	Rheumatism	May 5, 1914
Meyer, Bruno	C. 8th Cal. Vol. Inf.	Private	60	Germany	60	32 00	Rheumatism	Nov. 28, 1913
Meyer, John	E. 1st U. S. Cav.	Sergeant	10	Germany	60	---	Partial paralysis	Nov. 15, 1899
Michels, Theodore	E. 8th Cal. Inf.	Private	14	Austria	68	35 00	Rheumatism	Oct. 3, 1909
Mikulech, Jacob C.	U. S. Navy	Ord. Seaman	36	Switzerland	73	40 00	Partial loss of vision	Jan. 8, 1915
Miller, Charles No. 4	G. 25th Ill. Inf.	Private	20	Indiana	77	38 00	Age	Dec. 15, 1915
Miller, George Franklin	D. 3d Cal. Inf.	Private	20	Ohio	64	40 00	Rupture	July 7, 1905
Miller, Jacob	M. 6th Ohio Cav.	Private	20	Ohio	61	---	Defective vision	Feb. 8, 1919
Miller, Jacob No. 2	L. 6th U. S. Cav.	Private	36	Wisconsin	71	40 00	Throat trouble	April 24, 1916
Miller, John No. 5	B. 1st Wash. Ter. Inf.	Private	24	Pennsylvania	48	40 00	General debility	Aug. 1, 1891
Mills, Andrew B. V.	E. 23d N. Y. Inf.	Private	14	Scotland	64	12 00	Dysentery	Dec. 6, 1910
Moir, George	B. Utah Lt. Art.	Private	6	Ireland	70	21 00	Blind	Oct. 27, 1908
Monahan, William	A. 27th N. Y. H. Art.	Sergeant	121	Kentucky	33	24 00	Deafness, etc.	July 31, 1910
Montgomery, Samuel M.	Hosp. Corps, U. S. A.	Private	28	Ireland	73	20 00	Age	Sept. 1, 1915
Mooney, Francis	B. 71st Pa. Inf.	Private	28	Ireland	73	20 00	Age	Sept. 1, 1915

Moosa, John W.	H, 20th U. S. Inf.	Private	38	Germany	59	8 00	Prostatitis	Aug. 19, 1911
Moran, John	C, 26th U. S. Inf.	Corporal	74	Ireland	49		Double hernia	June 3, 1919
Morgan, John S.	A, 8th Cal. Inf.	Private	11	Illinois	65	32 00	Rheumatism	July 23, 1907
Morris, John	A, 99th N. Y. Inf.	Private	37	Russia	63	30 00	Rheumatism	Dec. 8, 1903
Morton, Charles H.	F, 6th Cal. Vol. Inf.	Private	5	Connecticut	59		Lumbago	Aug. 9, 1916
Mosler, Madison	I, 29th Ill. Inf.	Private	38	Alabama	76	40 00	Age	Dec. 2, 1904
Mott, William E.	F, 14th Conn. Inf.	Private	25	New York	57	40 00	General debility	Dec. 19, 1893
Mount, Thomas G.	F, 77th Ill. Inf.	Private	33	Illinois	68	40 00	Paralysis	Feb. 14, 1914
Muller, Frederick	Hosp. Corps, U. S. A.	Private	12	New Jersey	53		Sciatica, etc.	Aug. 27, 1908
Muller, Fritz A.	U. S. Navy	Ord. Seaman	120	Germany	48	8 00	Rheumatism	Mar. 11, 1910
Munroe, Kirk	G, 24 U. S. H. Art.	Private	7	Massachusetts	52		Defective sight, broken hand	Mar. 11, 1919
Murphy, John, No. 8	F, 34 U. S. Inf., etc.	Sergeant	99	Ireland	57		Loss left arm	July 27, 1917
Murphy, Patrick	F, 24 U. S. Art.	Private	53	Ireland	67		Rupture	May 20, 1913
Murray, George W.	B, 21 U. S. Art.	2d Lieut.	38	Ireland	75	40 00	Stomach trouble	July 14, 1917
Murray, Michael	K, 1st N. Y. Mtd. Rifles, etc.	Private	19	Ireland	45		Articular rheumatism	Sept. 14, 1914
Murray, Thomas R., alias	G, 27th U. S. Vol. Inf.	Private	60	Ireland	60	7 50	Rheumatism	Sept. 26, 1900
Thos. R. Morphy	I, 10th Pa. Cav., etc.	Corporal	30	Indiana	60	40 00	Rheumatism	Dec. 27, 1900
Myers, Elihu S.	H, 23d Ind. Inf., etc.	Private	38	Ohio	70	19 00	Paralysis	Feb. 5, 1913
Neff, Joseph B.	K, 7th Ill. Cav.	Private	7	Indiana	67	19 00	Heart trouble	May 1, 1913
Newby, William	G, 23d Ohio Inf.	Private	34	Ohio	76	40 00	Age	Dec. 9, 1908
Newkirk, George	H, 101st Ind. Inf.	Private	26	New York	43	24 00	General debility	April 18, 1890
Newton, James W., alias	A, 100th N. Y. Inf., etc.	Private	10	Missouri	72	32 00	Dysentery	Jan. 26, 1916
James Wardwell	L, 16th Mo. Cav.	Private	24	New York	57	40 00	Rupture	Aug. 27, 1897
Norman, Newton	K, 21st N. Y. Inf.	Private	60	Prussia	71		Age, etc.	May 24, 1916
Norris, Ebbelbert G.	A, 8th U. S. Inf.	Private	36	Ireland	55	40 00	Heart disease	April 15, 1897
Normann, Wilhelm H.	U. S. Navy	Landsman	3	Missouri	65		Rheumatism	Sept. 15, 1911
O'Brien, John	F, 3d Kans. Militia	Private	10	Ireland	73	30 00	Old age	Sept. 19, 1885
O'Brien, Talbert S.	E, 9th Md. Inf.	Private	16	New York	71	35 00	Rheumatism	Oct. 21, 1915
O'Donnell, Patrick	A, 38th Wis. Inf.	Landsman	3	Massachusetts	65	30 00	Rupture	July 31, 1912
Oler, George W.	U. S. Navy	Fireman	15	Connecticut	72	35 00	Age	Dec. 12, 1916
O'Neill, Timothy	U. S. Navy	Private	19	Canada	71	38 00	Rheumatism	Oct. 1, 1913
Osborn, Ambrose A.	25th Indt. N. Y. L. Art.	Private	16	Sweden	45		General debility	Oct. 15, 1904
Osborn, Henry H.	D, 1st Bat. Cal. Vol. H. A.	Fireman	39	Sweden	69		Age	Dec. 13, 1915
Ostberg, Per. A.	U. S. Navy	Private	6	Indiana	70	20 00	G. S. W. left thigh	Aug. 27, 1913
Osterberg, John F.	H, 116th Ind. Inf.	Private	35	Prince Edward Island	46	30 00	Loss right leg	April 7, 1895
Owens, John W.	U. S. Navy	Ord. Seaman	32	New York	73	40 00	Rheumatism	July 13, 1912
Palmer, Hugh	D, 3d Mich. Inf., etc.	Private	248	Norway	43	20 36	Rheumatism	Nov. 7, 1907
Parish, Mortimer	U. S. Navy	Landsman						
Pedersen, Jacob								

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Pemberton, William D.	C, 12th W. Va. Inf.	Private	33	West Virginia	75	40 00	Cardiac weakness	Aug. 22, 1913
Penlertby, Richard H.	K, 17th Wis. Inf.	Private	8	Wisconsin	68	32 00	Rheumatism	Sept. 23, 1916
Pendergast, Enos	U. S. Navy	Seaman	14	Ireland	62	35 00	Rheumatism	June 29, 1902
Perkins, Eliert G.	D, 61st Mass. Inf.	Private	10	Maine	60	32 00	La grippe	April 14, 1906
Perry, William A.	E, 25th N. Y. Cav.	Sergeant	14	New York	68	35 00	Injury right leg	June 19, 1915
Peterman, Gustave	E, 36th U. S. V. Inf.	Sergeant	212	Germany	61	20 00	Loss 3 fingers and hand	April 6, 1911
Pettyjohn, Moses	B, 34th Ohio Inf.	Private	26	Ohio	75	40 00	Loss of leg	June 28, 1915
Phalen, Henry	B, 34th N. Y. S. M. Inf.	Private	2	New York	72	40 00	Rheumatism	Feb. 9, 1917
Phelan, John	U. S. Navy	Coal passer	14	Ireland	65	35 00	Sciatica	Mar. 21, 1909
Phillips, William	H, 8th Iowa Inf.	Private	36	Pennsylvania	73	40 00	Wounded	Jan. 21, 1916
Pidge, William C.	1st Bat. Wis. L. Art.	Private	36	New York	75	40 00	Age	Mar. 14, 1918
Pierce Charles O.	I, 34th U. S. V. Inf.	Private	15	Tennessee	47	30 00	Chronic diarrhea	Jan. 4, 1919
Pierpont, John B.	K, 10th Conn. Inf.	Private	37	Canada	59	40 00	Partial paralysis	July 6, 1904
Pifer, Alvan	D, 14th Pa. Cav.	Private	18	Pennsylvania	70	38 00	General debility	Oct. 4, 1916
Pilger, John	E, 9th Ohio Cav., etc.	Private	36	Germany	58	40 00	Varicose veins	Oct. 24, 1902
Pipvey, Edward W.	B, 36th Mass. Inf.	Private	34	Prince Edward Island	57	40 00	Rheumatism	May 16, 1893
Porter, Thornton G.	B, 2d Cal. Cav.	Private	37	Missouri	78	40 00	Eczema	July 15, 1913
Pratt, Edwin	K, 57th Mass. Inf.	Corporal	16	Massachusetts	69	35 00	Disease of rectum	Dec. 26, 1914
Price, James H.	U. S. Navy	Nurse	29	Pennsylvania	53	40 00	General debility	May 18, 1898
Pryor, Jeremiah	C, 2d Cal. Inf.	Private	12	Missouri	69	32 00	Rheumatism	Jan. 25, 1912
Rady, Philip	3d Mass. Cav.	Bugler	19	Massachusetts	49	38 00	Rheumatism	Dec. 15, 1893
Randall, Warren G.	D, 1st Maine Cav.	Private	19	Maine	58	30 00	Rheumatism	Sept. 30, 1904
Randle, Samuel	E, 1st Nev. Cav.	Private	22	Pennsylvania	69	27 00	Nervous trouble	Feb. 28, 1915
Raycroft, Fred	Band, 4th Va. Inf.	Chf. Musician	9	England	60	20 00	Chronic plenisy	June 13, 1913
Raymond, George W.	B, 7th Minn. Inf.	Private	28	New York	72	33 00	Rheumatism	Oct. 16, 1911
Reardon, John	U. S. Navy	Landsmen	47	Missouri	52	38 00	Rheumatism	Nov. 23, 1895
Reel, John W.	F, 76th Ind. Inf.	Private	1	Indiana	80	22 50	Rupture	May 3, 1919
Rein, Sebastian	I, 19th Ohio Inf.	Private	6	Austria	80	22 50	Rheumatism	Dec. 30, 1913
Reinville, Joseph	F, 1st Ill. L. Art.	Private	21	Vermont	55	25 00	Partial blindness	Nov. 8, 1900
Rheinhardt, Jared C.	K, 34th Pa. Inf., etc.	Private	49	Pennsylvania	71	40 00	General debility	Mar. 16, 1911
Renkin, Carsten J.	1st Cal. Vol. H. Art.	Private	7	Germany	47	35 00	Rheumatism	Jan. 10, 1913
Rhoades, John	E, 9th Iowa Cav.	Private	28	England	76	40 00	Ace, rheumatism	Nov. 5, 1911
Rhoda, William C.	B, 14th Ill. Inf.	Private	11	Illinois	75	32 00	Rheumatism	July 23, 1913
Richardson, Theodore W.	K, 15th Ind. Inf.	Private	33	Indiana	70	40 00	Rheumatism	Sept. 22, 1912
Riley, Elias F.	C, 7th Va. Inf.	Private	4	Virginia	76	38 00	Rheumatism	April 28, 1916

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

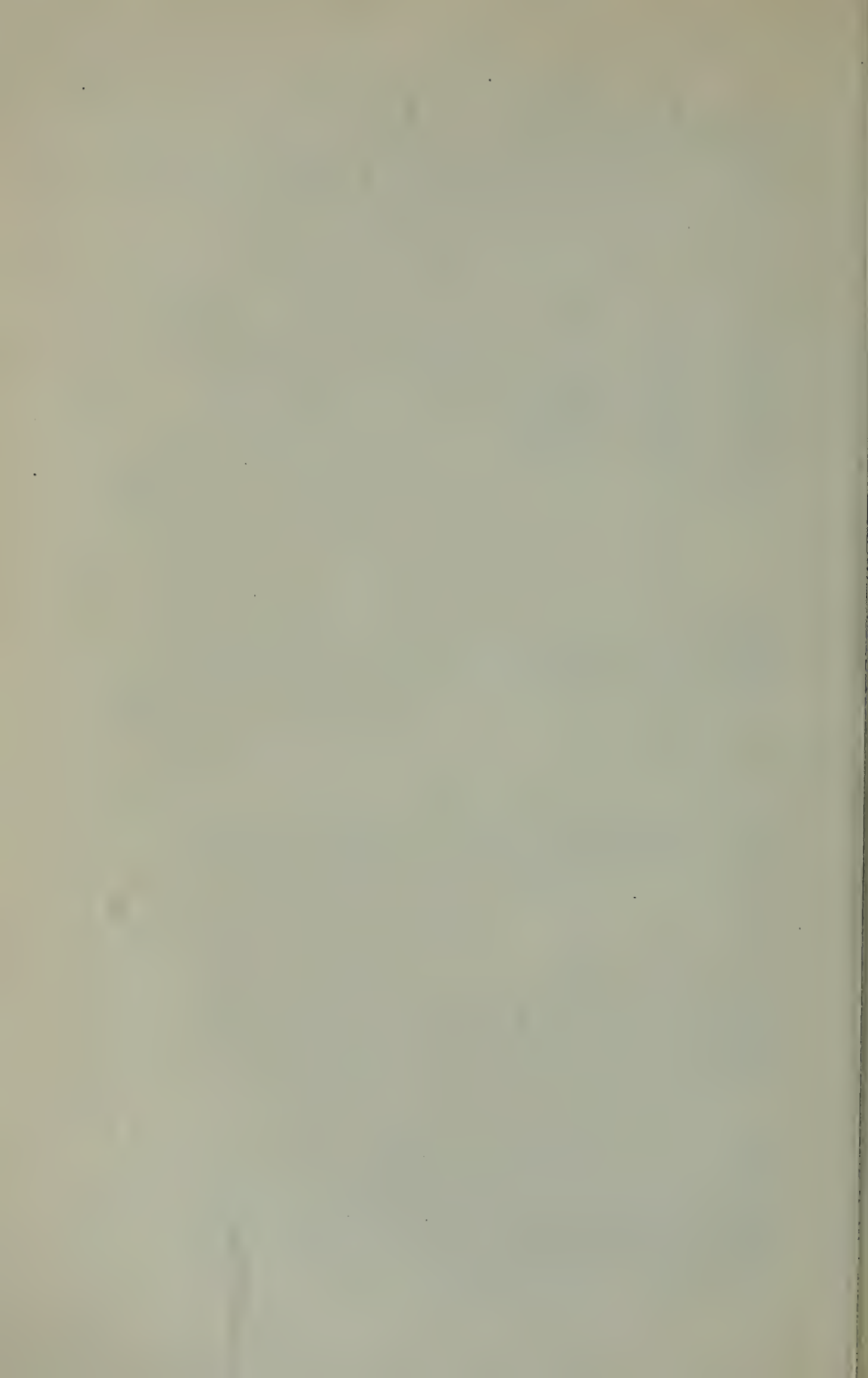
Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Shofer, John H., Jr.	G, 2d Cal. Cav.	Private	14	Indiana	65	30 00	Paralysis	Mar. 26, 1914
Short, Charles J.	M, 11th U. S. Cav.	Saddler	16	New York	46		Fractured ribs	Dec. 29, 1913
Shottenkirk, Chauncey F.	I, 21st Ill. Inf.	Corporal	24	New York	67	40 00	Age	Nov. 19, 1913
Skels, Spencer L.	A, 15th Ohio Inf.	Private	17	New York	65	30 00	Rheumatism	Jan. 5, 1910
Slade, John W.	A, 1st Cal. Vol. Inf.	Private	14	Indiana	48	40 00	Loss of right leg	Jan. 30, 1912
Smith, Albert	K, 10th U. S. Cav.	Private	36	South Carolina	39		Hemorrhoids	Oct. 8, 1916
Smith, DeWitt C. R.	K, 11th Ill. Inf., etc.	Musician	46	Indiana	70	30 00	Age	Dec. 11, 1916
Smith, Edward No. 2.	U. S. Navy	Landsman	12	New York	55	30 00	Neuresthesia; hernia	Sept. 23, 1916
Smith, Edward No. 3.	E, 1st N. Y. Eng.	Private	37	Ireland	69	40 00	Rheumatism	Dec. 20, 1909
Smith, James, alias								
Syvester Mayo	U. S. Navy	Seaman	37	Nova Scotia	63	40 00	Crippled arm	April 15, 1896
Smith, William T.	38th Coast Art.	Private	34	North Carolina	57		Malaria	Jan. 22, 1919
Snyder, Martin	A, 10th Pa. Inf.	Private	33	Germany	64	30 00	Lame hip	Dec. 17, 1909
Snyder, Marshall	A, 9th N. J. Inf.	Private	3	New Jersey	63	30 00	Rheumatism	Sept. 23, 1909
Sonha, Frank M.	Hosp. Corps	Private	17	Poland	52		Asthma	Aug. 30, 1918
Spankie, Gilbert W.	E, 1st Idaho Vol. Inf.	Private	11	Ireland	55	6 00	Total blindness	Feb. 19, 1917
Sparhawk, Edward P.	F, 4th Md. Inf.	Private	32	Maryland	56	40 00	General debility	Aug. 6, 1894
Sprick, Henry	E, 1st U. S. Cav.	Private	60	Germany	60	20 00	Toes of both feet frozen	Dec. 5, 1914
Spurgeon, Felix	F, 2d Ohio Hy. Art.	Private	24	Ohio	53	40 00	Rheumatism	Dec. 21, 1899
Squibb, Samuel	F, 7th Ind. Cav.	Private	31	Ohio	65	40 00	Rheumatism	Dec. 3, 1911
Stabler, John	A Battrn. O. N. G. Cav.	Private	2	Germany	82		Defective sight	June 18, 1914
Steele, Henry C.	D, 7th Iowa Inf.	Private	17	Iowa	70	30 00	Bronchitis	June 7, 1914
Stephenson, Ira B.	C, 20th U. S. Inf., etc.	Private	25	Indiana	43		Rheumatism; malaria	Jan. 15, 1903
Stevenson, Daniel	I, 4th Mo. Inf.	Private	11	Kentucky	68	30 00	Rheumatism	Jan. 14, 1918
Stewart, John T.	C, 7th Iowa Cav.	Private	50	Ohio	67	40 00	Heart trouble	Mar. 9, 1913
Stewart, Joseph	F, 51st Wis. Inf.	Corporal	5	New York	76	30 00	Pericarditis, etc.	June 21, 1919
Stolle, William	3d Battrn. N. J. Lt. Art.	Private	16	Prussia	52	35 00	Kidney disease	Sept. 24, 1892
Storrs, Andrew J.	H, 14th Ohio Inf.	Private	4	Ohio	72	40 00	General debility	June 11, 1918
Stovall, William H.	B, 25th Maine Inf.	Private	12	Maine	58	22 50	Rheumatism; paralysis	Dec. 16, 1895
Stutz, Frederick	C, 5th Pa. Inf.	Private	38	Bavaria	83	40 00	Age	April 2, 1918
Sullivan, Adrian	Band, 14th U. S. Inf.	Musician	73	Michigan	41		Rheumatism	Feb. 2, 1911
Sullivan, Jeremiah J.	C, 121st N. Y. Inf.	Private	3	Ireland	68	12 00	Rheumatism; blind left eye	Nov. 23, 1916
Sullivan, John No. 2.	U. S. Navy	Fireman	36	California	39	8 00	Rheumatism	Mar. 20, 1903
Sullivan, John No. 5.	U. S. Navy	Coal heaver	36	Ireland	82	40 00	Kidney trouble	July 6, 1914
Sullivan, Michael	D, 2d Conn. Inf.	Private	12	Ireland	53	35 00	Rupture	Sept. 6, 1894
Sutherland, Demotte W.	A, 8th Ill. Inf.	Private	13	Illinois	63	35 00	Lead poisoning	May 24, 1911
Swinn, Calvin A.	K, 1st U. S. Inf.	Private	60	Minnesota	59		Lead poisoning	Mar. 1, 1915
Symes, Aaron S.	I, 1st N. J. Inf.	Corporal	37	England	78	40 00	Nervousness	June 19, 1919

Talbot, John	U. S. Eng.	Private	11	England	60	Sclatic rheumatism	Nov. 2, 1912
Tanner, Elijah	F, 174th Ohio Inf.	Private	5	Ohio	64	Rheumatism	Jan. 1, 1911
Tansey, Edward J.	A, 132d Ill. Inf.	Private	11	Illinois	71	Age	July 13, 1916
Tateburg, Ernest W.	I, 39th Ill. Inf., etc.	Sergeant	50	Germany	79	Age	Nov. 17, 1911
Taylor, James O.	K, 32d Mass. Inf.	Private	6	Massachusetts	76	Gunsnot wound left knee	June 17, 1913
Taylor, Samuel W.	E, 5th Maine Inf.	Private	44	Maine	69	General debility	Oct. 12, 1913
Taylor, Thomas H.	G, 17th Mass. Inf.	Private	14	England	54	Rheumatism	July 4, 1884
Taylor, William H.	K, 6th Cal. Inf.	Private	48	Indiana	58	Heart trouble; rheumatism	May 15, 1905
Thomas, Alfred J.	A, 2d Cal. Cav.	Private	23	Wales	74	Dislocated shoulder	Jan. 6, 1904
Thomas, Emanuel	M, 48th U. S. Y. Inf.	Private	20	Illinois	58	Stomach trouble	May 15, 1916
Thomas, George H.	C, 2d Ill. Vol. Inf.	Private	12	Kentucky	49	Partial paralysis	Nov. 13, 1918
Thomas, George W.	H, 2d Ga. Vol. Inf.	Private	23	Tennessee	53	Loss right hand and left foot	Jan. 21, 1919
Thomas, Lewis	M, 1st Ind. Hy. Art.	Private	7	Missouri	58	Rheumatism	Jan. 22, 1904
Thompson, Almer	H, 122d N. Y. Inf.	Corporal	26	Maryland	67	Loss right arm	April 25, 1911
Thompson, Charles E.	G, 1st Cal. Vol. Inf.	1st Lieut.	62	California	67	Lame from old fracture	May 26, 1919
Thompson, James W.	A, 3d Ind. Cav.	Sergeant	39	Ohio	77	Age; vertigo	May 13, 1919
Thurston, George	H, 83th Ill. Inf.	Private	28	Indiana	65	Rupture	Feb. 10, 1910
Tibbetts, John W.	A, 8th Maine Inf.	Private	43	Maine	77	Rheumatism	April 22, 1919
Titus, Lewis	5th Ind. Bat. Wis. Lt. Art.	Private	18	Vermont	63	General debility	Oct. 23, 1897
Tool, John	D, 11th Mass. Lt. Art.	Private	7	Pennsylvania	55	Piles	Jan. 1, 1905
Topping, George W.	K, 2d U. S. Cav., etc.	Private	96	Ohio	44	Swollen legs	July 23, 1916
Tremble, Cyrian	I, 20th Mass Inf.	Private	20	Canada	63	Lame left shoulder	Feb. 10, 1910
True, Charles S., alias							
Chas. T. Shaw	U. S. Navy	Landsman	14	Maine	71	Partial blindness	Sept. 13, 1918
Tuck, John W.	G, 28th Ill. Inf.	Private	26	Maine	65	Partial paralysis	Sept. 27, 1910
Tussee, William	F, 50th Mo. Inf.	Private	12	Missouri	68	Partial paralysis right hand	July 16, 1911
Twitshell, George W.	A, 47th Ill. Inf.	Corporal	28	Maine	63	Varicose veins	Dec. 5, 1908
Tyler, Chauncey A.	A, 16th Iowa Inf.	Private	19	Iowa	64	Lumbago	April 20, 1909
Ulman, John	C, 8th Kans. Inf.	Private	22	Germany	60	Kidney trouble	May 3, 1901
Upton, Robert T.	K, 30th Mich. Inf.	Private	8	Ohio	74	Lumbago	Nov. 4, 1898
Ursenbach, Louis F.	Band, 3d U. S. Art.	Corporal	31	Switzerland	35	Bronchitis	Dec. 12, 1901
Van Camp, Behus	E, 3d Mich. Cav.	Bugler	53	Indiana	56	Rupture	Mar. 15, 1889
Vanderhoof, Martin V.	M, 15th N. Y. Eng.	Artificer	9	New York	73	Rheumatism; hemorrhoids	Feb. 19, 1917
Van Deventer, Gerardus H.	Hosp. Corps, U. S. A.	Private	72	Holland	46	Ventral hernia	Dec. 30, 1917
Van Deventer, George W.	E, 2d Mich. Inf.	Private	39	Michigan	73	Age	Jan. 15, 1915
Venn, Samuel	U. S. Navy	Seaman	181	England	49	Tuberculosis	Oct. 14, 1913
Vogler, Remiguis	I, 41st N. Y. Inf.	Private	24	Switzerland	65	Rheumatism	Dec. 31, 1909
Voss, Charles O.	L, 5th U. S. Cav.	Corporal	36	Germany	49	Injury to left leg	Oct. 27, 1916
Wake, Alfred	I, 15th Kans. Cav.	Private	26	Illinois	73	Rheumatism	Aug. 12, 1918
Waldron, George W.	C, 1st Batt. Cal. Vol. H. A.	Private	11	California	49	Neuritis	Mar. 21, 1912
Walker, William B.	H, 3d U. S. Art.	Corporal	60	Georgia	49	Myocarditis	Jan. 22, 1913

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when ad- mitted	Pen- sion per month	Disability	When admitted
Walsh, John	Unassigned, 17th Mich. Inf.	Private	1	Ohio	68		Nervous trouble	Jan. 17, 1918
Wansley, John H.	F. 2nd Ind. Inf.	Private	46	Indiana	80		Stomach trouble	Nov. 2, 1919
Wangler, Anton	B. 43d Ill. Inf.	Private	35	Germany	76	40 00	Atrophoid	Dec. 5, 1911
Ward, Charles H.	C. 1st Cal. Vol. Hy. Art.	Private	7	California	58		Rheumatism	Mar. 27, 1912
Ware, Edwin	I. 2d Cal. Cav.	Private	18	Indiana	72	35 00	Paralysis agitans	July 25, 1908
Warren, Forrest G.	U. S. Navy	Coal passer	48	California	84		Rheumatism	Nov. 16, 1908
Warren, John H.	F. 16th Mich. Inf.	Private	6	New York	72	30 00	Rheumatism; senility	Jan. 2, 1908
Warren, Julian B.	B. 1st Batt. Cal. Vol. H. A.	Private	7	California	36		Partial deafness	May 12, 1916
Watt, Joseph A.	F. 14th Pa. Cav., etc.	Private	25	Pennsylvania	54	40 00	Fracture of ankle	May 17, 1899
Wauz, James H.	D. 13th Iowa Inf.	Private	8	Iowa	77	32 00	Lame back	April 7, 1919
Weaver, Lafayette	F. 7th Ohio Inf.	Private	4	Ohio	70	30 00	Lame back	Nov. 6, 1912
Weese, Samuel H.	A. 149th Ind. Inf.	Private	6	Indiana	66		General debility	April 5, 1913
Weidman, Rudolph	H. 17th U. S. Inf.	Artificer	60	Switzerland	69		Piles	Feb. 8, 1911
Weingart, Matthew	L. 3d N. J. Cav.	Private	10	Germany	67	12 00	Rheumatism	June 29, 1910
Wentworth, Nathaniel	B. 38th Mass. Inf.	1st Sergeant	39	New Hampshire	73	40 00	Varicose veins	Sept. 29, 1910
Wentworth, Orrin S.	I. 26th Maine Inf., etc.	Private	18	Maine	57	35 00	Heart and kidney trouble	Sept. 9, 1903
Werby, Charles	Ordnance Dept., U. S. A.	1st Class Private	36	Switzerland	53		Heart trouble	Oct. 8, 1912
Werner, Gotlieb	H. 54th N. Y. Inf.	Private	55	Germany	98	46 00	Lame feet	June 4, 1889
Wescott, Harrison	I. 7th Maine Inf.	Private	35	Maine	73	30 00	Age	Mar. 28, 1916
West, Daniel J.	H. 1st Conn. Inf., etc.	1st Lieut.	40	New York	87	40 00	Age	June 8, 1918
Wetsell, George W.	U. S. Navy	Drummer	57	New York	57	40 00	Bronchitis	Nov. 30, 1902
Whisler, Abraham	K. 12th Ohio Inf.	Private	50	Ohio	74	40 00	Age	Nov. 15, 1915
Whitaker, James S.	D. 12th Wis. Inf.	Private	15	Ohio	68	30 00	Rupture and piles	July 9, 1915
White, Thomas F.	D. 1st Nev. Vol. Inf.	Private	3	Massachusetts	50		Injury to left arm	Sept. 16, 1908
Whitlatch, Clarence	32d Coast Art.	Private	36	Indiana	36		Loss both feet	Jan. 24, 1918
Whitlock, William H.	F. 7th Cal. Inf.	Corporal	16	Michigan	73	35 00	Rupture	Mar. 11, 1914
Whitney, Henry H.	H. 10th N. Y. Inf.	Sergeant	34	New York	50	40 00	Rheumatism	June 21, 1900
Widley, Charles	U. S. Navy	Seaman	97	Massachusetts	68	40 00	Rheumatism	May 14, 1910
Wilkes, Blair	I. 184th Ohio Inf.	Private	7	Ohio	65	32 00	Rheumatism	April 5, 1911
Wiley, Granville	U. S. Navy	Asst. 3d A. Eng.	38	New Hampshire	71	40 00	Rheumatism	Oct. 15, 1908
Williams, Edgar S.	A. 133d Ind. Inf.	Private	4	Indiana	64	32 00	Rheumatism	Dec. 17, 1911
Wilson, Hiram C.	F. 18th Mo. Inf.	Corporal	45	Missouri	70	40 00	Gunsbot wound right leg	Mar. 19, 1913
Wilson, James H.	U. S. Army	Act. Hosp. Stew.	8	Ohio	54		Rheumatism	May 29, 1918
Wilson, William	U. S. Navy	Landman	36	California	41		Varicose veins	Mar. 24, 1919
Wobbe, John	Hosp. Corps, U. S. A.	Private	37	Germany	49		Neuralgia	Nov. 25, 1918
Woodford, Charles W.	B. 6th Cal. Inf.	Private	13	Indiana	77	35 00	Paralysis	July 7, 1916
Woods, George H.	A. 1st Nev. Vol. Cav.	Private	13	Massachusetts	45	6 00	Rheumatism	Jan. 25, 1906

Woods, William B.	H, 30th Ill. Inf.	Private	15	Illinois	71	35 00	Bladder trouble	Mar. 8, 1910
Woodward, Charles H.	F, 21st U. S. Inf.	Sergeant	60	Illinois	61		Rheumatism	Oct. 6, 1910
Woodward, Howard B.	A, 22d Ill. Inf., etc.	Private	39	Wisconsin	63	40 00	Loss left leg	Aug. 11, 1911
Woodward, William	A, 4th Va. Inf.	Private	12	California	48	6 00	Defective sight	Dec. 3, 1910
Wortser, George	E, 1st S. Dakota Inf.	Private	13	Wisconsin	56		Bronchitis	Dec. 12, 1914
Wray, John, known as								
John Good	G, 1st Conn. Cav.	Private	6	Massachusetts	53	32 00	Disease of eyes	Jan. 29, 1893
Wright, Benjamin F.	D, 45th Iowa Inf.	Private	4	Indiana	73	30 00	General debility	June 18, 1913
Writer, Orion E.	L, 57th Mass. Inf.	Private	37	Ireland	52	32 00	Disease of kidneys	Sept. 14, 1896
Younger, Elton R.	L, 36th U. S. Vol. Inf., etc.	QM. Sergeant	19	California	52		Chronic dysentery	Aug. 24, 1903
Zander, Henry D.	Hosp. Corps U. S. A.	Private	12	New York	55		Paralysis	Feb. 24, 1919
Zeller, William	H, 1st Mont. Vol. Inf., etc.	Corporal	31	Germany	51		Malaria	Dec. 2, 1913
Zerby, Jacob	D, 46th Ill. Inf.	Private	24	Illinois	47	30 00	Rheumatism	July 14, 1896
Zipfel, Joseph R.	U. S. Navy	Water tender	30	Ohio	57	6 00	Injury to right wrist	Aug. 20, 1912



VETERANS' HOME OF CALIFORNIA

ANNUAL REPORT

OF

Board of Directors and Officers

Fiscal Year ended June 30, 1920

Location of Home:

Veterans' Home Post Office, Napa County, California
Railroad Station, Yountville



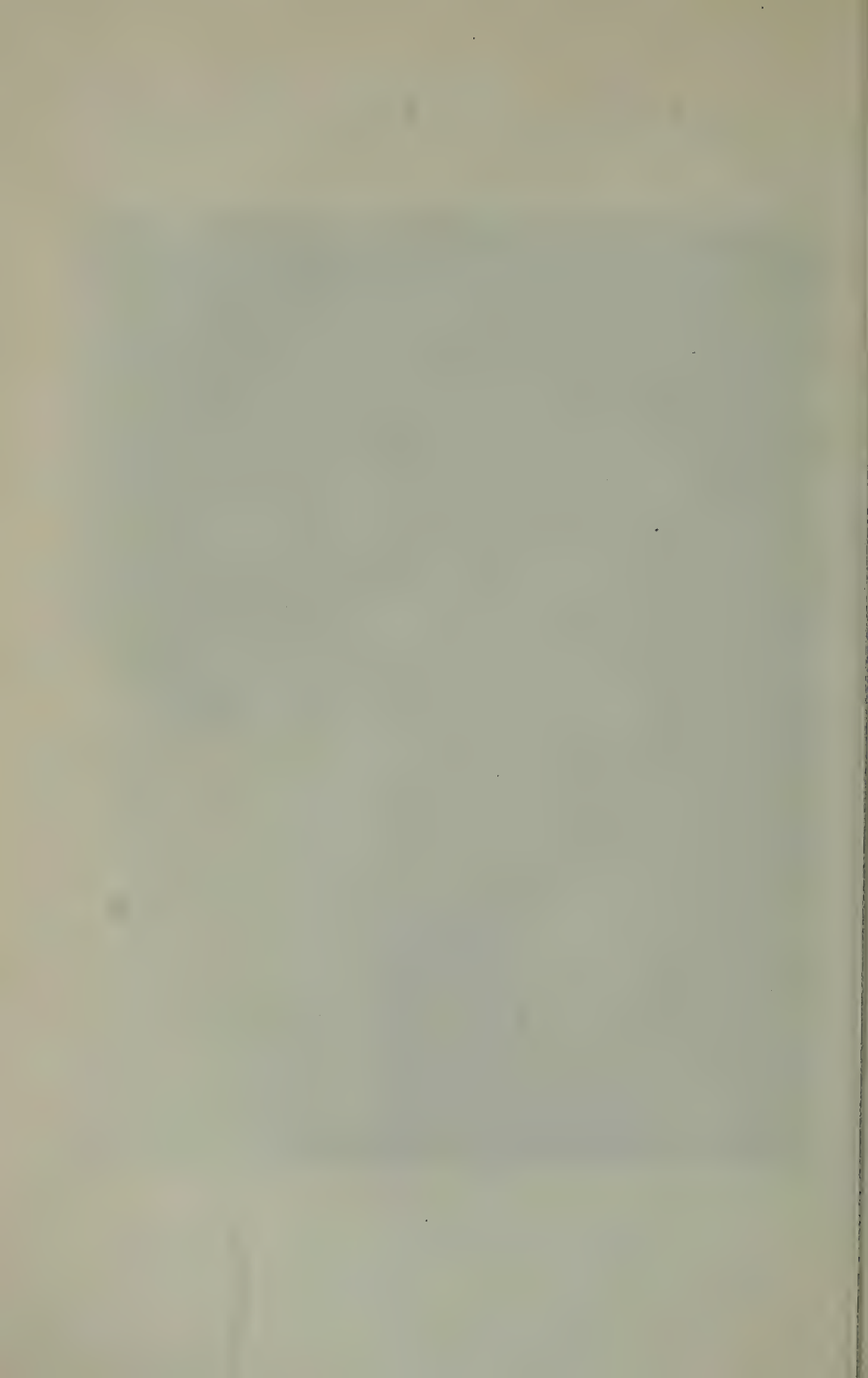
CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1921



GENERAL VIEW OF HOME.

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BOARD OF DIRECTORS AND OFFICERS, 1919-1920.

SAMUEL W. BACKUS	San Francisco
President and ex officio member of all committees.	
HUGH M. BURKE	San Francisco
Vice President.	
JOHN C. CURRIER	San Francisco
G. PARKER DILLON, M.D.	Sacramento
E. B. HINMAN	San Francisco
JAMES O. PREWETT	Sacramento
C. DE COLMESNIL	Secretary-Treasurer.

OFFICIAL AND MEDICAL STAFF, RESIDENT AT VETERANS' HOME, 1919-1920.

COLONEL NELSON M. HOLDERMAN	Commandant
CAPTAIN S. M. MONTGOMERY	Adjutant
C. DE COLMESNIL	Secretary-Treasurer
MAJOR JOHN N. BLOOD	Surgeon
CAPTAIN T. W. LAWRENCE	Chief Engineer
CAPTAIN FRED C. BUTLER	Quartermaster-Commissary
CAPTAIN DANIEL F. CALLINAN	Assistant Surgeon

STANDING COMMITTEES, 1919-1920

Auditing Committee,

Directors HINMAN, CURRIER.

Building and Grounds Committee,

Directors CURRIER, BURKE.

Hospital Committee,

Directors DILLON, PREWETT.

Library and Amusements Committee,

Directors BURKE, HINMAN.

Law Committee,

Directors PREWETT, BURKE.

BOARD OF SURVEY.

COLONEL NELSON M. HOLDERMAN	Commandant
MAJOR JOHN N. BLOOD	Surgeon
CAPTAIN FRED C. BUTLER	Quartermaster-Commissary



LINCOLN THEATER

REPORT OF PRESIDENT.

VETERANS' HOME, CALIFORNIA,
January 1, 1921.

Honorable WILLIAM D. STEPHENS,
GOVERNOR OF CALIFORNIA.

SIR: Herewith I have the honor to hand you reports of the officers of the Veterans' Home of California for the fiscal year ended June 30, 1920. In this my nineteenth annual report as President of the Board of Directors I desire to convey to you the thanks of the Directors of the Home for your interest and assistance and also to express our appreciation of the courtesy and consideration extended by the various State officials.

It has been very difficult to carry the Home through this fiscal year on account of the limited appropriation allowed us, but with the help of the State Board of Control we will be able to ease the situation by creating a deficit. While it has been difficult to finance the Home, we still feel that the Veterans have been made as comfortable as possible with the limited means at our disposal.

The Home has, for the use of its members, one of the finest libraries in the state, in which are to be found the best standard and many of the new books as they are published, with also a plentiful supply of magazines and newspapers.

We also have a fine, up to date moving picture outfit and in our theater are shown, four or five times a week, first-class moving picture entertainments.

On November 10, 1920, we were fortunate in securing the services of Capt. Fred P. Bliss as Quartermaster-Commissary. Captain Bliss formerly served the Home in this capacity and we believe his incumbency will add to the efficiency of the Home.

On June 30, 1919, Dr. John N. Blood was elected Chief Surgeon and on January 4, 1920, Dr. Daniel F. Callinan was elected Assistant Surgeon. Since the incumbency of these two gentlemen the Hospital has been efficiently run and the Veterans dependent upon the Hospital for care have been treated with skill and given every care.

Respectfully submitted.

SAMUEL W. BACKUS,
President, Board of Directors.



ADMINISTRATION BUILDING.

REPORT OF COMMANDANT.

HEADQUARTERS VETERANS' HOME, CALIFORNIA,

January 6, 1921.

From: Nelson M. Holderman, Commandant.
To: President and Members of the Board of Directors.
Subject: Report for Fiscal Year ending June 30, 1920.

1. The Commandant has the honor to submit herewith reports of the Secretary-Treasurer, Chief Surgeon, Adjutant, Quartermaster-Commissary and the Chief Engineer for the fiscal year ended June 30, 1920.

2. The Commandant came from the United States Army a Captain of Infantry to the command of the Veterans' Home December 1, 1919, and owing to the fact that he has resigned as Commandant of the Home to reenter the United States Army, he wishes to say that his duties during the past year, as Commandant of the Veterans' Home of California, have been most pleasant and agreeable, as the Board of Directors, officers and members of the Home and the civilian employees have given him at all times their most hearty cooperation and support. The Commandant also wishes to say that the various boards and commissions with which the Veterans' Home is associated have worked in harmony and cooperation with him in every way, and he feels that the affairs of the Home have progressed smoothly and harmoniously.

3. The officers in charge of the various departments have been instructed by the Commandant in submitting their reports to cover in detail the affairs pertaining to their respective departments; therefore the Commandant's report will cover in a general way the conduct of the Home, the needs, etc.

4. Under the direct supervision of the Commandant the various departments have functioned, teamwork being observed which is so essential in exacting efficiency as a whole. Under the most able supervision of the Secretary-Treasurer, the accounting department has efficiently handled their work, which to a great extent is operated in connection with the various boards and commissions. The Chief Surgeon has efficiently conducted the Post Hospital and effected many changes for the better. The Adjutant has kept all personal records pertaining to the membership of the Home; he has also kept records of all inspections and work in connection with the War Department and National Board of Managers. The Quartermaster has received and disbursed all supplies and has advised and directed the mess. The Chief Engineer has supervised all construction work and maintained all engineering equipment, supervising the operation of the same.

5. The Commandant wishes to respectfully invite the attention of the Board of Directors and all concerned to the fact that during the past year, and as a result of the unsettled conditions following the late war, that all food commodities, labor and material have been extremely high; therefore the cost of operation has been higher than it would have been normally. The pay roll has also increased as the civil service standard of wages has been established.

6. The Commandant has personally prepared and submitted the budget for the ensuing two years. In view of the depreciated and run-down condition in general of the Veterans' Home of California and in view of the fact that there are over one hundred sixty thousand soldiers, sailors and marines of the late war from California alone besides the Civil War, Indian War and the Spanish American War soldiers, all of whom are eligible for admission to the Veterans' Home of California, it is recommended that a program extending over a period be followed, sufficient money being appropriated at the meeting of each legislature to effect a reasonable amount of reconstruction and at the same time not interfering with the progress of the other state institutions. It is thought that by carefully disbursing moneys appropriated that at the end of a ten-year period the Veterans' Home can be fully reconstructed and placed upon a substantial footing which is necessary if the Veterans' Home is to be maintained by the State of California.

7. The Commandant wishes to respectfully invite the attention of the Honorable Board of Directors to the fact that the Veterans' Home of California was established and that the first buildings were erected in 1883, new buildings being added from time to time, until the Home has developed to its present size; but no new fireproof buildings have been erected, which are very much needed. The barracks buildings especially are all in very bad condition having depreciated as a result of age, which has rendered them unfit for further use, as it is most impossible to keep the pests known as bedbugs down. These pests effect their entrance in various ways and secret themselves in old wooden casings and elsewhere. It is my opinion that barracks buildings for soldiers' homes should be constructed on the one-story plan which renders them easily accessible for old and crippled soldiers. Hot water by all means should be provided in all wash and bath rooms of the respective barracks buildings, lockers for the use of the men for hanging clothes, etc., would make for efficiency and sanitary conditions which are so vitally essential to the conduct of any organization. These men are soldiers and if given the proper facilities, I find them always more than willing to do their part in every way. I recommend that a new ward, for men that are too feeble to properly attend themselves in every way owing to infirmities and old age, be constructed at the hospital as it is impossible for a company commander to care for men of this character. They are not really sick but need assistance. A first and second attendant should be assigned to these men under the supervision of the Chief Surgeon.

8. The Commandant has also noticed a great deal of dissatisfaction among the civilian employees owing to there being no quarters provided for their families. The heads of the various departments such as the Head Gardener, Head Cooks of both the Main dining room and the Hospital dining room, the Head Baker, Laundryman and many others who really, to a great extent, are responsible and who are always able to do more efficient work in every way if they are quartered with their families on the reservation.

When the National Board of Managers discarded the blue uniforms for the Army olive drab, I believe in doing so that they incurred the dissatisfaction of the most of the members of the various homes. I

believe the blue uniform is more appropriate to the soldiers of the Civil War, the Indian War, and the Spanish American War and will recommend that this Home discard the olive drab and adopt the blue uniforms again.

10. It is come to the notice of the Commandant that many of the state homes and some few of the national homes are in favor and are contemplating doing away with the military status of the homes. The Commandant is very much opposed to the plan, for in so doing the status of the homes would drift into the same class with a charitable institution which a soldiers home is by no means intended, as the men who live in the soldiers homes have earned the right to be there by virtue of service to their country in time of war, and a great many of whom have incurred disabilities incident to their service and not as a result of their own misconduct. These men are still soldiers and wish to be known as such and not as inmates of a charitable institution. I do not believe in severe discipline but that the Home should be conducted through kindness and fairness which is absolutely essential in making a real home for these men who so rightfully deserve it. These men wish to be known as members of a military organization; therefore the military status, which exists in all the homes both state and Federal, at the present time should remain, for these men wish it to remain and that they be known as members and not as inmates.

11. All holidays have been properly observed and with proper entertainments which have been appropriate to the respective holidays.

12. The general health and discipline of the members of the Home during the entire year have been excellent.

13. In closing the Commandant wishes to say that he has tendered his resignation as Commandant of the Veterans' Home and is to return to the United States Army. He wishes to thank the Honorable Board of Directors for their most hearty support, kindness and cooperation. To the officers and civilian employees he wishes to extend his sincere thanks and appreciation for their most exceptional loyalty, devotion and cooperation. To the members of the Home he wishes to express his most profound respect and appreciation. They have conducted themselves like real soldiers that they are and the Commandant regrets to leave them more than he can tell. The year at the Home has been made most pleasant in every respect for the Commandant and his family and on departing he can sincerely say that the past year has been one of the most successful of his life.

NELSON M. HOLDERMAN,
Captain, United States Army,
Commandant.

REPORT OF SECRETARY-TREASURER.

VETERANS' HOME, July 1, 1920.

To the President and Board of Directors,

Veterans' Home of California.

(Through COL. NELSON M. HOLDERMAN, *Commandant*.)

GENTLEMEN: I have the honor to submit herewith statement of receipts, disbursements and transactions of the Veterans' Home of California for the seventy-first fiscal year, ended June 30, 1920.

Trial Balance, Control Ledger	Schedule 1
Statement of Income	Schedule 2
Statement of Expenditures, State	Schedule 3
Statement of Expenditures, Post Fund	Schedule 4
Statement of Cash Receipts and Disbursements.....	Schedule 5
Statements of Veterans' Transactions.....	Schedule 6

Respectfully submitted.

C. DE COLMESNIL,
Secretary-Treasurer.

SCHEDULE 1.

Trial Balance—Control Ledger Accounts, as of June 30, 1920.

Funding group:	Debit		Credit
Available appropriated funds.....	\$220,383 63	Support, 71st and 72d fiscal years..	\$180,000 00
		Printing, 71st and 72d fiscal years..	1,404 16
		Distilling water	4 85
		Hospital	90
		Storehouse and commissary	1 82
		Repairs to buildings.....	59
		Cold storage	21 71
		Fire escapes	255 63
		Plumbing	1 38
		Grounds	1 04
		Repairs to buildings.....	82
		Surgeon's residence	26
		Company C, repairs.....	61
		Lavatories	24 65
		Painting buildings	6 33
		Repairs to buildings.....	1 19
		Septic tank	3 06
		Construction pipe line.....	62 23
		Plumbing repairs	48
		Assembly Building	95 57
		Dairy barn repairs.....	21
		Sanitary cottages.....	10
		Repairs to buildings.....	81
		Bathrooms	20
		Plumbing repairs	2 59
		Electric wiring	1 90
		Constructing tubercular ward.....	5 39
		Painting buildings	196 80
		Repairs to buildings.....	93 81
		Completion wiring system.....	72 71
		Plumbing and repairs.....	1 06
		Construction incubate quar-	
		ters	33
		Construction chapel	36
		Enlarging hospital kitchen.....	678 06
		Installation of boilers.....	12,467 59
		Purchase dairy cows.....	1,575 41
		Repairs, improvements and	
		equipment	23,396 11
Totals	\$220,383 63		\$220,383 66
Proprietary group:			
Stores	\$19,828 81	Stores pending	\$701 10
Maintenance fund, 71st fiscal year..	7,690 90	Maintenance fund, 69th fiscal year	6,599 74
United States aid receivable.....	17,490 00	Maintenance fund, 70th fiscal year	14,429 59
Warrants receivable	14,688 81	Claims filed	15,294 53
Bank, commercial	605 72	Excess income, prior years.....	25,901 09
Bank, state	571 50	Revolving fund	1,000 09
Accounts receivable	1,050 31	Accountability for properties.....	96 639 98
Revolving fund cash.....	1,000 00		
Reserve for revolving fund.....	1,000 00		
Properties	96,639 98		
Totals	\$160,561 03		\$160,561 03
Post fund group:			
Post store stock.....	\$3,054 45	Claims payable	\$2,856 76
Bank, commercial	7,006 92	Accountability for properties.....	15,927 13
Bank, savings	5,141 51		
Revolving fund	225 00		
Interest earned	753 27		
Properties	2,602 74		
Totals	\$18,783 89		\$18,783 89
Trust group:			
Members' special deposit fund:		Depositors	\$24,550 70
Bank, commercial	\$17,884 42	Interest	5,585 80
Bank, savings	5,253 08		
Revolving fund	3,000 00		
Liberty bond investment.....	4,000 00		
Totals	\$30,137 50		\$30,137 50

SCHEDULE 2.

Statement of Income for the Period July 1, 1919, to June 30, 1920—
Seventy-first Fiscal Year.

Income		Total
Appropriated:		
Maintenance appropriations	\$180,000 00	
Printing appropriations	1,344 25	
Special appropriations	7,010 83	
Emergency appropriations	25,000 00	
Special appropriations, Engineering Department	43,390 10	
		\$256,615 18
United States Aid:		
Quarter ending September 30, 1919	\$13,975 00	
Quarter ending December 31, 1919	13,016 67	
Quarter ending March 31, 1920	18,546 33	
Quarter ending June 30, 1920	17,490 00	
		63,028 00
Departmental:		
Farm and orchard	\$4,493 21	
Dairy	674 43	
Hog ranch	498 61	
Poultry plant	352 79	
Vegetable garden	65 84	
Mechanical Department	55 00	
Rents	120 00	
Board, director's cottage	333 10	
Board, hospital	18 00	
Bakery	393 60	
Payments for lost clothing	95 25	
Sale of bones and hides	135 97	
Sale of rags and sacks	374 43	
Sale of junk	125 88	
Sale of property	39 26	
		7,778 90
		\$327,452 08
Post fund:		
Post stores gross sales	\$17,410 41	
Moving picture gross receipts	3,122 71	
Receipts from posthumous account	3,612 72	
Interest on savings accounts	1,796 92	
Receipts from transportation advances	4 30	
		25,947 06
Total income		\$353,399 14

SCHEDULE 3.

Statement of Expenditures (State), for the Period July 1, 1919, to June 30, 1920—
Seventy-first Fiscal Year.

	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Total
Support and Subsistence:					
Feeding	\$57,374 95	\$23,490 14	\$733 60	\$2,091 77	\$83,686 86
Clothing	24,638 35	718 64	92 70	25,419 69	
Housekeeping	1,658 42	2,858 39	70 20	4,600 91	8,587 92
Laundry	1,915 01	2,198 34	4 90	1,050 47	5,168 72
Totals	\$84,953 73	\$29,265 51	\$88 10	\$7,835 85	\$122,863 19
Care and Welfare:					
Attendance		\$2,761 97			\$2,761 97
Medical care	\$5,425 01	23,673 60	\$48 45	\$767 62	29,914 68
Personal care	913 91	262 45			1,176 33
Amusement	2 00	5,479 38	13 73		5,495 11
Burials	24 92	1,531 53			1,556 45
Totals	\$6,365 84	\$33,708 93	\$62 18	\$767 62	\$40,904 57
Maintenance of Building, Grounds:					
Carpentering	\$1,559 99	\$2,479 98			\$4,039 97
Landscape gardening	180 15	4,573 20		\$6 50	4,759 85
Masonry		40 00			40 00
Painting	388 27	413 00			801 27
Plumbing	265 46	1,255 82			1,521 28
State Department of Engineering			\$7,477 15		7,477 15
Totals	\$2,393 87	\$8,762 00	\$7,477 15	\$6 50	\$18,639 52
Farming:					
Dairy	\$1,965 45	\$1,744 04	\$28 00	\$512 22	\$1,249 71
Farm and orchard	1,259 94	5,384 33	4 65	478 95	7,073 87
Hog ranch	6,310 97	1,103 00	2 20	161 60	7,637 77
Poultry ranch	8,345 14	1,380 00		1,234 98	10,939 12
Vegetable garden	187 45	1,905 75			2,093 20
Stable and tractor	818 58	3,070 05	23 38		3,915 01
Totals	\$18,833 53	\$14,647 17	\$31 23	\$2,387 75	\$35,929 68
General:					
Local board			\$246 02		\$246 02
Commandant		\$2,307 00	76 20		2,373 20
General offices	\$1,569 63	13,533 20	257 78	\$109 35	15,500 68
Postage			285 00		285 00
Telephone and telegraph		540 00	703 20		1,243 20
Automobile	813 56	1,917 80	94 23	1,588 71	4,414 30
Freight, cartage and express			201 02		2 1 02
Light, heat and power	27,115 50	5,158 09	3,094 47	445 33	35,813 39
Refrigeration	160 07	798 34			959 31
Fire protection	15 43				15 43
Stores breakage	1 55				1 55
Stores shrinkage	46 68				46 68
Stores adjustments	764 59				764 59
Miscellaneous	448 42				448 42
Stores condemned	38 48				38 48
Totals	\$30,971 84	\$24,280 52	\$4,957 92	\$2,143 39	\$62,353 67
Total general expenditures	\$143,521 81	\$110,634 13	\$13,363 58	\$13,141 11	\$280,633 63
Additions and Betterments:					
Structures and nonstructural im- provements, Department of Engineering				\$35,812 95	\$35,812 95
Grand total expenditures	\$143,521 81	\$110,634 13	\$13,363 58	\$48,954 06	\$316,513 58

SCHEDULE 4.

Statement of Expenditures (Post Fund), for the Period July 1, 1919, to June 30, 1920—
Seventy-first Fiscal Year.

	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Support and Subsistence:					
Feeding	\$45 00				\$45 00
Clothing			\$40 47		40 47
Totals	\$45 00		\$40 47		\$85 47
Care and Welfare:					
Medical care			\$31 18		\$31 18
Burials			15 00		15 00
Religion—Chapel		\$531 50			531 50
Education—Library	\$30 91	582 44	346 55	\$228 26	1,188 16
Amusement—Entertainments	189 84		184 00	59 00	432 84
Amusement—Moving pictures	20 39	1,851 25	2,987 17		4,858 81
Amusement—Billiards and bowling	722 70		11 10	24 05	757 85
Amusement—Band			23 39	91 20	114 59
Totals	\$963 84	\$2,965 19	\$3,598 39	\$402 51	\$7,929 93
General:					
Protection—Surety bonds			\$88 40		\$88 40
Protection—Burglar insurance			270 12		270 12
Advances to veterans			12 93		12 93
Freight, cartage and express			131 90		131 90
Post Store—Operating	\$260 82	\$1,125 16	65 09	\$597 38	2,048 45
Post Store—Stock purchases	14,507 05				14,507 05
Miscellaneous			53 25		53 25
Totals	\$14,767 87	\$1,125 15	\$621 63	\$597 38	\$17,112 10
Total expenditures	\$15,776 71	\$4,090 35	\$4,230 55	\$999 89	\$25,127 50

SCHEDULE 5.

Statement of Bank Deposits and Withdrawals for the Period July 1, 1919, to
June 30, 1920.

	Balance July 1, 1919	Deposits	Withdrawals	Balance July 1, 1920
General Accounts:				
Bank, commercial		\$318,320 23	\$317,714 02	\$605 72
Bank, state	744 55	9,359 14	9,532 19	571 50
Bank, revolving fund	1,000 00			1,000 00
Post Fund Accounts:				
Bank, commercial	2,679 82	28,844 27	24,517 17	7,006 92
Bank, savings	7,041 25	100 80	2,030 34	5,141 51
Bank revolving fund	1,025 00		800 00	225 00
Trust—Members' Special Deposits:				
Bank, commercial	10,446 17	40,448 16	32,979 91	17,884 42
Bank, savings	5,164 53	422 27	333 72	5,253 08
Revolving fund	3,000 00			3,000 00
Totals	\$31,101 32	\$397,464 90	\$387,878 07	\$40,688 17

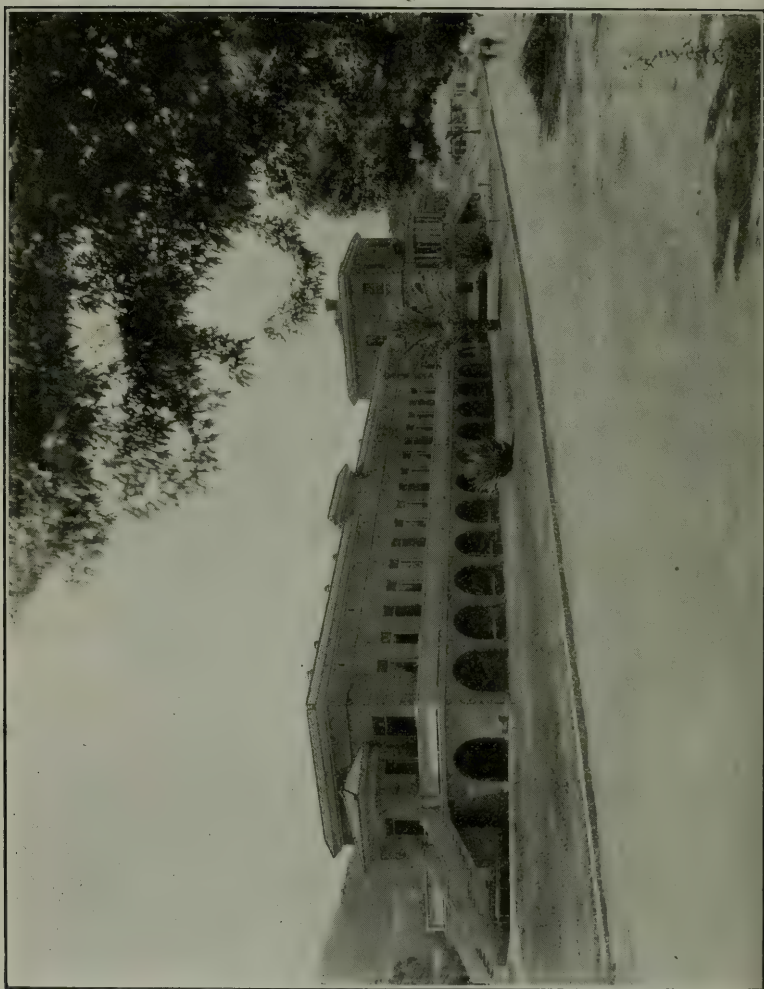
SCHEDULE 6.

Transactions—Members' Special Deposit Accounts, Year Ended June 30, 1920.

Active accounts at beginning.....	109	Deposits made by veterans.....	549
New accounts opened.....	177	Disbursements, cash	692
		Disbursements by check.....	488
	286		
Accounts closed during period.....	167	Total transactions	1,729
Active accounts at close of period.....	119		

UNITED STATES PENSIONS TO VETERANS.

Pension checks cashed for veterans during the year ended June 30, 1920..... \$105,694 79



REPORT OF SURGEON.

HOSPITAL, VETERANS' HOME OF CALIFORNIA,

July 1, 1920.

*President Board of Directors,**Veterans' Home of California.*(Through COL. NELSON M. HOLDERMAN, *Commandant.*)

SIR: I have the honor to submit herewith the annual report of the Hospital for the fiscal year ending June 30, 1920.

Number of patients in Hospital July 1, 1919-----	107
Number of patients treated in Hospital during fiscal year 1920-----	546
Number of members admitted to Hospital-----	402
Number of Temporary at Post patients admitted to Hospital-----	144
Number of members discharged from Hospital-----	279
Number of Temporary at Post patients discharged from Hospital-----	111
Number of patients remaining in Hospital at close of fiscal year-----	123
Average number of patients at Hospital daily-----	117
Number of patients treated at sick call-----	5076
Daily average of patients at sick call-----	16.1
Number of surgical treatments and dressings-----	4294
Daily average of surgical treatments and dressings-----	11.7
Combined daily average of medical and surgical clinics-----	13.68
Number of deaths (including 5 Temporary at Post) during fiscal year-----	99
Of the above—	
73 were Civil War Veterans, whose average age at death was 77 years.	
20 were Spanish War veterans, whose average age at death was 50 years.	
5 were Indian War veterans, whose average age at death was 70 years.	
1 was a Mexican War veteran, whose age at death was 92 years.	
Percentage of deaths to total number treated in Hospital was-----	16.8
Per cent age of member death-----	15.0
General average age at death-----	72.25

The following surgery has been cared for during the year:

Stilling operation for dachryocystitis-----	1	Excision of onychorryptosis-----	1
Capsulotomy and iridotomy-----	1	Removal of finger nail-----	1
Hemorrhoidectomy-----	2	Furuncles and carbuncles incised-----	5
Appendectomy-----	1	Fractured rib-----	2
Herniotomy-----	3	Abscess axillary gland-----	3
Fracture of clavicle-----	2	Perineal abscess-----	1
Fracture, both bones of forearm-----	1	Hydrocele-----	4
Fracture radius-----	1	Tooth extractions-----	22
Excision first metatarsal bones of both feet-----	1	Alveolar abscess-----	1
Laceration of right leg-----	1	Excision necrosed rib-----	3
		Miscellaneous-----	30

The general health of the members has been good; but owing to the advanced ages there are many now in quarters who are not in the strictest sense sick; but who should have hospital care. These men are in most cases so feeble that they have the greatest difficulty in taking care of themselves.

The urgent need, therefore, is that the hospital capacity should be enlarged by at least a hundred more beds to care for these cases.

I am unalterably of the opinion that to add more cottages would be the greatest folly: First, because as more buildings are scattered about, the cost of maintenance goes up out of all proportion and efficiency drops in a like ratio; secondly, wood structures are, at best, a bad fire risk and with sick men the hazard is increased because of their inability to help themselves.

I would like to suggest, therefore, that every effort be put forth to secure a one building fireproof Hospital.

Respectfully submitted.

JOHN N. BLOOD,
Major, Chief Surgeon.

STATEMENT OF DEATHS AND CAUSE.

No.	Name	Age	Service	Date	Nativity	Cause of death
1	Hunter, John D.	79	G. 70th N. Y. Inf.	July 1, 1919	Scotland	Cerebral arterio sclerosis.
2	Osberg, Per A.	62	D. 1st Cal. Hy. Art.	July 5, 1919	Sweden	Terminal pneumonia of tuberculosis; pericarditis.
3	Stevenson, Daniel	75	F. 51st Wis. Inf.	July 15, 1919	New York	Chronic valvular heart disease (mitral regurgitation); myocardial insufficiency.
4	Butterfield, Fessenden	75	C. 7th Ill. Cav.	July 16, 1919	Maine	Cerebral hemorrhage.
5	Glass, Julius R.	56	U. S. Navy	July 19, 1919	Germany	Carcinoma, glandular, of the neck.
6	Smith, William N.	74	B. 13th Ohio Inf.	July 20, 1919	Ohio	Chronic interstitial nephritis.
7	Bum, Ernest A.	74	I. 14th U. S. Inf.	July 20, 1919	Germany	Chronic valvular heart disease.
8	Beecher, Miles J.	84	C. 3d, and K 13th Conn. Inf.	July 24, 1919	Connecticut	Cerebral hemorrhage.
9	Duffy, Charles	66	C. 1st U. S. Cav.	July 28, 1919	Connecticut	Cerebral hemorrhage.
10	Ludwig, Charles	48	F. 71st N. Y. V. Inf.	Aug. 2, 1919	Germany	Cirrhosis of liver.
11	Green, William H.	82	K. 6th Cal. Inf.	Aug. 14, 1919	Massachusetts	Chronic interstitial nephritis.
12	Hosking, Oliver	53	H. 1st Colo. V. Inf.	Aug. 19, 1919	Michigan	Myocardial degeneration; intestinal obstruction.
13	Burchard, Charles	73	C. 3d I. Cav.	Aug. 31, 1919	Rhode Island	Uremia and toxic ulcer of face.
14	Gehring, Erhard	80	E. 35th N. J. Inf.	Sept. 2, 1919	Switzerland	Chronic valvular heart disease.
15	Bliss, Willis L.	55	A. 1st Cal. Hy. Art.	Sept. 14, 1919	New York	Inanition; duodenal obstruction.
16	Gassert, Charles	74	F. 13th N. Y. Inf.	Sept. 19, 1919	New York	Septicemia; myocardial insufficiency.
17	Mosier, Madison C.	83	I. 29th Ill. Inf.	Sept. 19, 1919	Alabama	Cerebral hemorrhage; arterio sclerosis.
18	Murphy, Daniel	81	B. 152d Ind. Inf.	Sept. 21, 1919	Scotland	Gangrene; arterio sclerosis.
19	Smith, Edward	72	U. S. Navy	Sept. 28, 1919	Ireland	(Entered in dying condition; lived seven days.) Cerebral thrombosis, with failure of respiratory center.
20	Blackler, Charles B.	85	B. 137th U. S. V. Inf.	Sept. 28, 1919	England	Cerebral hemorrhage; arterio sclerosis.
21	Stutz, Frederick	84	76th Pa. Inf.	Oct. 7, 1919	Bavaria	Cerebral thrombosis; arterio sclerosis.
22	Green, Victor M.	41	B. 3d Batt. U. S. Sig. Corps	Oct. 9, 1919	New York	Pulmonary tuberculosis.
23	Jones, Oscar	34	A. 9th U. S. Cav.	Oct. 15, 1919	Georgia	Chronic valvular heart disease.
24	Kelley, Edward	78	3d Cal. Inf.	Oct. 17, 1919	Illinois	Chronic interstitial nephritis; cystitis; uremic poisoning.
25	Foster, Peyton	92	D. 4th Ill. Inf. (Mex. War)	Oct. 19, 1919	Illinois	Cerebral hemorrhage; arterio sclerosis.
26	Loganbaugh, Wm.	78	A. 27th Ohio Inf.	Oct. 27, 1919	Ohio	Cerebral hemorrhage; arterio sclerosis.
27	Long, Jonas F.	82	B. 7th Pa. Cav.	Oct. 27, 1919	Pennsylvania	Aortic insufficiency.
28	Fenton, George W.	80	H. 118th Ill. Inf.	Oct. 28, 1919	Vermont	Cerebral hemorrhage.
29	Thompson, James W.	76	A. 13th Ohio Inf.	Oct. 28, 1919	Ohio	Lobar pneumonia.
30	Liek, Peter	83	H. 150th Pa. Inf.	Oct. 30, 1919	Ohio	Apoplexy.
31	Ambrose, Wm. H. O.	70	C. 22d Ohio Inf.	Oct. 31, 1919	Ohio	Chronic valvular lesion of the heart.
32	Merrill, John E.	78	K. 8th Me. Inf.	Nov. 3, 1919	Maine	Chronic valvular heart disease.
33	Luce, Douglas	89	44th Ohio Inf.	Nov. 4, 1919	Ohio	Acute paraneurmatous nephritis; chronic cystitis.

34	Van Camp, John	72	D, Ohio Hy. Art.	Nov. 8, 1919	Ohio	Chronic valvular heart disease; mitral insufficiency.
35	Whalen, Matthew J.	53	M, 6th U. S. Inf.	Nov. 11, 1919	New York	Pulmonary tuberculosis.
36	Roberts, William	72	D, 3d, Wis. Inf.	Nov. 16, 1919	Wisconsin	Pulmonary tuberculosis.
37	Wiley, George	73	B, 72d Ill. Inf.	Nov. 19, 1919	Illinois	Fracture of pelvis and other unknown injuries sustained in falling from height of four or five feet.
38	Randle, Samuel	75	E, 1st Nev. Cav.	Nov. 19, 1919	Pennsylvania	Apoplexy.
39	Sheehan, John F.	74	A, 25th Me. Inf.	Nov. 20, 1919	Ireland	Lobular pneumonia.
40	Russell, William	62	A, 11th U. S. Inf.	Nov. 20, 1919	Massachusetts	Chronic valvular heart disease; aortic regurgitation.
41	Mackin, John	56	U. S. Navy	Nov. 27, 1919	Ireland	Aortic insufficiency.
42	Mount, Thomas G.	74	F, 77th Ill. Inf.	Dec. 7, 1919	Illinois	Chronic glomerular nephritis; chronic cystitis.
43	Hammel, David	73	G, 161st Ohio Inf.	Dec. 7, 1919	Ohio	Lobar pneumonia.
44	Graham, Andrew J.	84	G, 6th Cal. Inf.	Dec. 20, 1919	Pennsylvania	Chronic valvular heart disease; aortic insufficiency.
45	Matter, Peter	82	E, 22d Iowa Inf.	Jan. 6, 1920	France	Cerebral hemorrhage.
46	Thomas, Emanuel	60	M, 49th U. S. Inf.	Jan. 16, 1920	Illinois	Chronic valvular heart disease; mitral insufficiency.
47	Hoogs, Charles	74	K, 80th Ohio Inf.	Jan. 16, 1920	Massachusetts	Cerebral hemorrhage.
48	Rush, John	75	K, 138d Pa. Inf.	Jan. 23, 1920	Ireland	Cerebral hemorrhage.
49	Basold, Jack E.	42	15th Batt. Field Art.	Jan. 23, 1920	New York	Pulmonary tuberculosis.
50	George, Percy W.	47	A, 1st Idaho V. Inf.	Feb. 13, 1920	California	Pulmonary tuberculosis.
51	Hamilton, William	74	E, 213th Pa. Inf.	Feb. 25, 1920	Pennsylvania	Valvular disease of the heart.
52	Markham, William A.	73	B, 49th Ky. Inf.	Feb. 2, 1920	Michigan	Cerebral hemorrhage.
53	Marshall, Joseph P.	43	F, 1st Cal. V. Inf.	Feb. 11, 1920	California	Pulmonary tuberculosis.
54	Myers, Hamilton C.	74	B, 11th Mich. Cav.	Feb. 15, 1920	Michigan	Cerebral thrombosis.
55	Howard, William G.	74	C, 1st Nev. Cav.	Mar. 6, 1920	Missouri	Cerebral thrombosis.
56	Heubig, William	74	C, 51st Pa. Inf.	Mar. 12, 1920	Germany	Broncho-pneumonia.
57	Reeves, Charles H.	82	I, 9th Ohio Inf.	Mar. 17, 1920	Pennsylvania	Pulmonary tuberculosis.
58	Hort, Riley J.	75	5th N. Y. Inf.	Mar. 16, 1920	New York	Valvular heart disease.
59	Peterman, Gustave	87	E, 10th N. Y. Hy. Art.	Mar. 23, 1920	Germany	Gangrene of left leg.
60	Holland, William A.	74	E, 36th U. S. V. Inf., etc.	Mar. 27, 1920	Ohio	Aortic insufficiency.
61	McManamy, Charles	76	C, 7th Ohio Inf.	Mar. 27, 1920	Ireland	Tubercular enteritis.
62	Vanderhoof, Martin V.	76	C, 51st Pa. Inf.	Mar. 27, 1920	New York	Cancer of rectum.
63	Herrick, Eugene	76	H, 15th N. Y. Eng.	April 11, 1920	New York	Cerebral hemorrhage.
64	Bell, Geo. W.	85	G, 30th Mich. Inf.	April 11, 1920	Pennsylvania	Gangrene of left foot.
65	Cook, Geo. B.	75	A, 50th Mass. Inf.	April 23, 1920	Massachusetts	Chronic valvular heart disease.
66	Simon, Isadore	72	G, 6th Cal. Inf.	April 23, 1920	Germany	Chronic interstitial nephritis.
67	Shinn, Walter W.	46	U. S. Navy	May 5, 1920	California	Bacillary dysentery.
68	Saunders, Thos. W.	72	G, 25th Mich. Inf.	May 8, 1920	New York	Cerebral hemorrhage.
69	Garrison, Daniel F.	79	B, 10th N. J. Inf.	May 9, 1920	New Jersey	Lobar pneumonia.
70	Ralston, William L.	68	C, 1st Nev. Inf.	May 12, 1920	Indiana	Valvular disease of the heart.

STATEMENT OF DEATHS AND CAUSE—Continued.

No	Name	Age	Service	Date	Nativity	Cause of death
71	Egnerick, David	73	E. 131st Ohio Inf.	May 14, 1920	Ohio	Cerebral hemorrhage.
72	Benson, Albert	73	E. 25th Iowa Inf.	May 15, 1920	Illinois	Chronic cystitis and valvular heart disease.
73	Fitzpatrick, John J.	42	A Battery, Cal. Hy Art.	May 18, 1920	England	Pulmonary tuberculosis.
74	Khule, Garret	77	E. 2d N. J. Inf.	May 22, 1920	New Jersey	Valvular disease of heart.
75	Stahl, Emil E.	81	G. 2d U. S. Vet. Inf.	May 29, 1920	Denmark	Lobar pneumonia; cerebral hemorrhage.
76	Whitworth, James F.	74	G. 1st Ore. Cav.	June 1, 1920	Illinois	Valvular disease of the heart.
77	Barton, James	83	H. 124th Pa. Inf.	June 6, 1920	Pennsylvania	Cerebral hemorrhage.
78	Brochert, Fredrick	87	A. 34th Ky. Inf.	June 7, 1920	Ohio	Cerebral hemorrhage; gangrene of right foot, caused by obstruction of arteries.
79	Boyer, William	75	C. S. Navy	June 25, 1920	Massachusetts	Chronic valvular heart disease.
80	Blyler, Louis M.	75	E. 142d Ind. Inf.	June 25, 1920	New York	Cerebral hemorrhage.
81	Cardner, William	78	M. 13th Mo. Inf.	June 24, 1920	Kentucky	Cerebral hemorrhage.
82	Jackson, Thomas	80	C. 5th U. S. Art., etc.	June 26, 1920	Canada	Cerebral hemorrhage.
83	Hastie, Gavin S.	79	Mus. 2d U. S. Art.	June 28, 1920	New York	Septicemia.

DIED IN HOSPITAL WHILE TEMPORARILY AT POST.

84	Red, Benjamin F.	76	G. 21st Pa. Cav.	Aug. 27, 1919	Pennsylvania	Pulmonary tuberculosis.
85	Dorson, David	44	G. 25th U. S. Inf.	Feb. 15, 1920	Georgia	Double lobar pneumonia.
86	Albro, William B.	82	I. 16th Ohio Inf.	June 16, 1920	New York	Chronic valvular disease of the heart.

DIED OUTSIDE OF HOSPITAL WHILE TEMPORARILY AT POST.

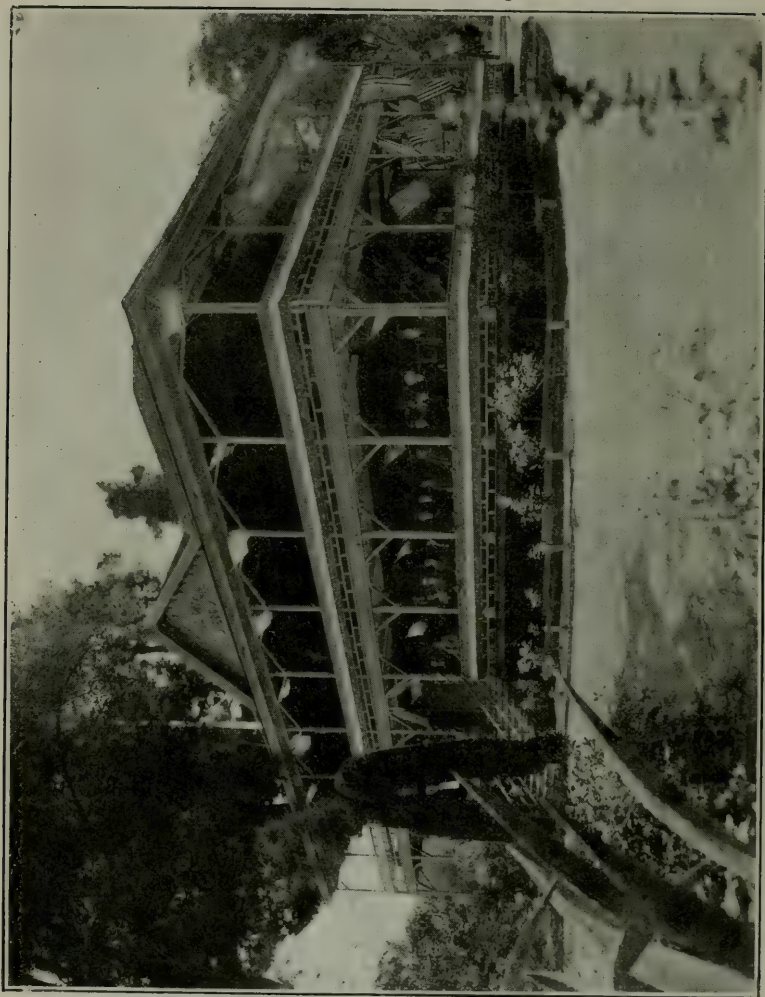
87	Stith, Newton S.	75	I. 133d Ill. Inf.	Sept. 23, 1919	Illinois	Cerebral hemorrhage. This man died at Napa State Insane Asylum.
88	Peterson, Andrew P.	82	K. 2d U. S. Cav.	April 18, 1920	—	Died in Quarters Company G; post mortem showed "enlarged and dilated heart with valvular incompetency; also, cholecystitis."

DIED AT VETERANS' HOME OUTSIDE THE HOSPITAL.

89	Franks, John	85	M, 1st Cal. V. Cav.	Sept. 25, 1919	Tennessee	Acute dilatation of the heart. Dropped dead after leaving main dining room.
90	Foy, Edwin B.	74	K, 20th Me. Inf.	Jan. 7, 1920	Maine	Rupture of ascending aorta. Dropped dead in Quarters Company B; post mortem examination.
91	Benson, Addison P.	72	E, 142d Ill. Inf.	April 18, 1920		Intestinal obstruction; angular impaction; cholecystitis and gall stones obstructing cystic duct. Died in Quarters Company A; post mortem.
92	Charles, Riley	73	H, 155th Ill. Inf.	May 25, 1920	Illinois	Chronic valvular disease of the heart. Died at Yountville.

DIED WHILE ABSENT FROM VETERANS' HOME.

93	Crosscott, George T.	39	U. S. Navy	July 3, 1919	California	Bright's disease. Died at Napa.
94	Barnhardt, Christian M.	63	I, 178th Ohio V. Inf.	Aug. 25, 1919	Pennsylvania	Chronic interstitial nephritis. Died at Lane Hospital, San Francisco.
95	Goodman, George R.	74	K, 25th Mo. Inf.	Sept. 13, 1919	Kentucky	Unknown. Died at Santa Rosa, California.
96	Fulthill, Edwin	74	U. S. Navy	Jan. 6, 1920	England	Unknown. Died at Sonoma, California.
97	Brosnan, James	53	A, 1st Cal. Hy Art.	Jan. 13, 1920	California	Ulcer of duodenum. Died at Saint Helena.
98	Page, Calvin	75	I, 1st Ark. Inf.	Jan. 30, 1920	Illinois	Acute cardiac dilatation with valvular incompetency.
99	Goodhart, Lewis		E, 16th U. S. Inf.	Feb. 1, 1920	Pennsylvania	Suicide. At San Diego, California.



MEMORIAL COTTAGE.

REPORT OF ENGINEER'S DEPARTMENT FOR FISCAL YEAR
ENDED JUNE 30, 1920.

*General SAMUEL W. BACKUS, President, and
the Board of Directors,
Veterans' Home of California.*

(Through COL. NELSON M. HOLDERMAN, *Commandant.*)

GENTLEMEN: I have the honor to present herewith a report of the work performed by the various departments under my supervision during the fiscal year ending June 30, 1920.

Commandant's Residence.

Shipping boxes made and furniture crates for Colonel Edmunds' furniture; drain boards, kitchen cabinet and coal boxes made.

Quartermaster's Residence.

Awnings placed for sleeping porch, kitchen table made, doorway cut, frame made for couch and new post placed for clothes line.

Treasurer's Residence.

Ten window shades installed and chicken yard fence overhauled and repaired.

Treasurer's Office.

New shelving installed in filing room of Treasurer's office.

Treasurer's Clerks' Cottage.

Night latch placed on door of sleeping porch.

Post Office.

Interior of building has been remodeled, new floor laid in bath room, window and door screens renewed, plumbing fixtures overhauled and repaired or replaced where needed, roof of building repaired.

Post Store.

Former sleeping room has been remodeled and is being used as a barber shop, new shelving and window screens installed, door way cut, doors hung and window shades installed; step ladder made for use in Post Store.

Restaurant.

Wash trays were overhauled and repaired.

Bowling Alley.

Railing at entrance steps has been removed and replaced with new railing.

Farmer's Residence.

Writing desk and phonograph record case made; screens were overhauled and repaired.

Main Dining Room, Kitchen and Bakery.

Screen doors in main dining room were overhauled and repaired, new tops placed on food carriers, work benches overhauled and repaired; new peels made, and wire screen on ventilator renewed for Bakery and forms made for bread pans; frames for sacking potatoes made for vegetable room.

Quartermaster's Department.

Oak tail gate made for Home bus; grating made for use in Tailor Shop; prune trays and fruit lug boxes were overhauled and repaired for orchard; bolts have been placed in doors of Commissary building; new platform laid on wagon scales; 30 plant boxes made for florist; 4 wooden shutters made for Commissary store room; wind shield made for auto truck; stool made for Tailor Shop; forms for concrete bases for motor and vacuum pump for new milking machine at Dairy Barn were made; 6 boxes made for Commissary for distributing goods to Home families; 2 window screens made for windows in prune storehouse; dry rack made for Laundry.

Chicken Ranch.

Ten feed troughs, 4 new gates, 5 feed boxes for young chicks, 3 chicken coops made, new attachments for windows in brooder house installed, coops overhauled and repaired and door frames, water troughs, feed boxes and roosts were made for the 2 new chicken houses recently erected by the State Department of Engineering.

Hog Ranch.

Two new gates made and bridge repaired.

Hospital.

Forms made for porch foundation at north end of Assistant Surgeon's quarters and concrete poured, posts set and wire strung for clothes line, screen door made and installed for same building.

Barracks and Quarters.

Three window shades, small locker installed in bath house, shelf made and installed, new porch floor laid and new floor joists placed, new steps and porch railing placed at No. 4 Cottage, screens were overhauled and repaired and new screen door made for Company "C." New drain boards and linen locker made for Company "B." Bench for airing mattresses, five window shades made and additional shelving placed in store room for Company "A," step ladder made for same barracks; thresholds and doors were overhauled and repaired where needed for Company "D"; platform for airing mattresses made and night latch and window shades installed in captain's office in Company "F"; house made for hose cart at Company "G."

General Carpenter Work.

Tool box made for Engineer's Department; new tongue placed in water wagon for Farm; window shade installed in Director's Cottage; coat and hat hooks installed and casket stands made for new Chapel; additional drawer placed in drafting desk at Engineer's office; shelf and hangers placed and curtain pole made for drop curtain for Chapel; copper kettles for Hospital were crated for shipment, window shades renewed and drop curtain hung in G. A. R. Hall; reading desk and lock box made for Chapel; tray made for plumber's tool chest; push cart for Engineer's Department was overhauled and repaired; trestles for pipe line at Dam were overhauled and strengthened; sliding door placed at south side of Carpenter Shop; 6 window shades installed in bowling alley; 87 burial caskets, 7 shipping boxes and 50 headboards were made during fiscal year.

Paint Shop.

New floors in Quartermaster's and Commissary office and store room were oiled; windows in operating room at Hospital were frosted; cook's room in Home restaurant has been painted and kalsomined; colored glass in doors of Company "B" has been removed and replaced with clear glass; 20 commodes stained and varnished for Company "B"; floor in Captain's office in Company "E" has been painted; new stairway at Company "B" painted and new floor in hallways oiled; interior of Captain's room at Company "F" has been painted; interior of new barber shop at Post Store has been painted; porches and steps at Main Dining Room, recently overhauled and repaired by the State Department of Engineering, have been painted; roofs of storehouse for farm tools and teamster's cottage, recently reshingled, have been painted with metallic paint; 34 lights of glass renewed at Hospital and 102 lights renewed around camp during the year; 84 caskets stained and varnished and 50 headboards painted and 58 headboards lettered during the year.

Tin Shop.

Covered galvanized iron food carrier with shelves made for carrying food from kitchen to adjoining buildings at Hospital; 9 garbage can covers made; 4 slop hopper strainers made for use in barracks; 4 kitchen tables covered with galvanized iron for Hospital; new gutter made for porch at Assistant Surgeon's quarters; 12 garbage cans and 12 galvanized iron buckets made for the Quartermaster's Department; smokestack made for Sergeant Major's residence; 24 feet of 8½-inch galvanized iron vent pipe made for dry room in Laundry; smokestack made for band leader's cottage; sample garbage can made for Chief Surgeon; galvanized iron switch box made for Butcher Shop; 2 zinc lined boxes for shipping caskets were made; new smokestack made for Hospital kitchen; 7 fireproof covers made for stove pipes in small cabins connected with Company "C"; 1 radiator cover and 2 slop hopper strainers made for Company "F"; 12 additional garbage cans for Quartermaster's Department; 2 compartment galvanized iron wash trays were made, 1 each for the Commandant's, Baker's and Treasurer's Clerk's residences; flashings were made for roof of porch

at Company "B"; steam boiler made for Hospital kitchen; double smokestack made for main kitchen; these new stacks, both of main and Hospital kitchens, were necessary owing to the increased draft required by the new burners recently installed; 5 slop hopper strainers made for Company "G."

Engineer's Department.

A new 2-inch gate valve was installed at water tank in vegetable garden; hose cart with 250 feet of 2½-inch bilateral fire hose has been installed at Hospital for additional fire protection; dough mixer in Bakery was overhauled and repacked; range in main Kitchen has been rebricked and plates replaced; boilers in Power House have been inspected by inspector for the State Industrial Accident Commission and same were found to be in a serviceable condition for use at a reduced pressure.

Ice Plant.

One hundred twenty-one tons, six hundred pounds of ice made and delivered during year as well as refrigeration for the various cold storages in operation in the Home.

STATE WORK.

Residences, Etc.

Steam line to Commandant's residence has been changed from a high to a low pressure system; steam heating has been installed at Quartermaster's residence; connections were made with existing line at Library and Amusement Hall; the interior of kitchen at Commandant's residence has been remodeled, window frames raised, wainscoating placed behind kitchen sink, kitchen sink taken out and relocated and 2 compartment galvanized iron wash trays installed; 2 compartment galvanized iron wash trays have been installed in Baker's and Treasurer's Clerks' residences; concrete foundation has been placed for sleeping porch for cook's quarters at Directors' Cottage.

Dairy Barn.

New stanchions have been erected in feeding shed; this work was done according to specifications furnished by Mr. Lathrop of the State Board of Control; wires have been run and motor installed for use in connection with new milking machine recently installed.

Offices and Shops.

Flooring in Commissary storeroom and offices has been replaced with new flooring and electric lights installed in basement; electric lights have been installed in refrigerating room at the Butcher Shop; guards have been placed around small washing machine in Laundry and same is now in use; shafting and pulleys have been placed for dry washing equipment and steam pressing table connected up for Laundry; new desk light installed in Treasurer's office; electric lights have been installed in Quartermaster's rag room and room used by the Home guards underneath Administration Building; poles have been erected,

wires run and motor connected up for running moss picking machine in Mattress Shop; farm tool storehouse has been shingled; roof of Police quarters has been reshingled; electric lighting system has been extended so as to include the Blacksmith Shop.

Main Dining Room, Kitchen and Bakery.

A new hot water storage tank has been installed for use of main Kitchen, Dining Room and Bakery and same has been covered with insulating material; this tank replaces one that was taken out, condemned as being unfitted for use for this purpose, by an Inspector of the State Industrial Accident Commission; brick work on Bakery oven has been repaired, pipe line from fuel oil supply line in Power House run, heater installed for oil, oil pump with motor placed and Barrion burner installed in oven at Bakery, but owing to insufficient space in flue, it was necessary to enlarge same before burner would work satisfactorily and since this work was done there has been no further trouble with the burner; new Seifert burners have been installed in main kitchen range and same are working satisfactorily; concrete foundations have been placed underneath porches on east, west and south side of main Dining Room, new flooring laid, new steps placed at entrances and new porch railing placed.

Barracks and Quarters.

Door way has been cut in room at Company "G" barracks and door hung, room to be used as a store room; old lavatory of Company "J" barracks has been remodeled for an office, lavatory and store room for use of Company Captain, new doors and windows placed, walls plastered and plumbing and electric fixtures installed; new stairway has been installed to upper floor of Company "B" barracks, porches on west side of barracks have been removed and closed passage way constructed connecting main building with lavatory and bath rooms on both floors; porch roof has been shingled and concrete foundations have been placed underneath building and porch, new steps installed at north and south entrances to building and new flooring laid in hallways on both floors. Porch at old quarters at Company "G" has been repaired, porch leveled and new flooring laid where needed. Room has been partitioned off in squad room at Company "D" for an office for Company Captain, door way cut, walls lathed and plastered, closets made and interior has been painted, new steps placed connecting office with ground, electric fixtures installed. Electric connections made for Tailor shop in Company "A." Daylight service installed in Company "G" lavatory and linen room; additional electric lights installed in Company "B" barracks. Teamster cottage has been re-shingled.

Hospital.

Daylight circuit has been installed in bath room and toilet on lower floor of Hospital employees' quarters; fire alarm system from Hospital to Power House has been overhauled and placed in a first class condition; steam heating system has been installed in Quarters for Inebriates Building and mains covered with insulating material, floors and

hallways of same building have been painted; interior wood work, walls and ceilings of the four Sanitary Cottages at Hospital have been painted; wiring has been run in conduit and porch lights placed on porch connecting Quarters for Inebriates with Hospital for Feeble-Minded Building; screened porch has been erected on north side of Assistant Surgeons Quarters; new sink has been placed in dark room for developing X-ray pictures; painters have completed the painting of the exterior of Main Hospital Buildings, color has been made to match existing color on all other buildings at Hospital recently constructed or remodeled there; conduit has been run, wiring and fixture placed in wall of room in Assistant Surgeon's quarters at Hospital to be used for attaching plugs for electric iron, etc.; interior wood work of upper floors of Main Hospital Buildings including operating and dressing rooms, offices, dining rooms and sleeping quarters have been painted and walls and ceilings painted with a washable wall paint; electric fixtures have been placed in Hospital employees' quarters; conduit and wiring have been run to connect electric fan in new Tubercular Wards; new laundry trays have been installed in Hospital Laundry and plumbing work and sewer connections made for same; porch at north side of Assistant Surgeon's quarters has been painted; galvanized iron down spouts have been installed at Inebriates Quarters and Hospital for Feeble-Minded and on porch connecting these buildings and hot water and steam pipes that had been uncovered for repairs, etc., in these buildings, have been recovered; steam and hot water connection for hospital kitchen have been remodeled; automatic cellar drain has been installed in steam room at Inebriates Quarters; new oil burners have been installed in kitchen range and same are working satisfactorily; motor of dishwashing machine has been taken out and replaced with a smaller motor, motor taken out is being used in machine shop at Power House for running machine tools; new sink has been installed in Ward No. 3; new fuel oil supply line has been run to Hospital kitchen as old supply line did not furnish sufficient gravity for new burners recently installed in range; a dark room for developing X-ray pictures has been constructed, door way cut, door hung and walls lathed and plastered; roof of the Feeble-Minded Hospital has been re-shingled and painted with a metallic paint; walls and ceiling of Steward's office and all walls and ceilings where plaster had become loose or broken or removed for alterations, have been re-plastered; wiring in dressing rooms and offices has been taken out and replaced with a larger wire, this was necessary owing to the installation of an X-ray machine, additional lights and fans in dark room and Surgeon's offices; the work of placing outside cement plaster, with a pebble finish, on outside walls of Hospital buildings, that had been removed to make alterations, has been completed; door way has been cut in solarium at Ward No. 2 and runway constructed for the purpose of taking patients unable to walk, from lower floors to operating room; large serving table in dining room has been covered with galvanized iron.

Chicken Ranch.

Two new chicken houses, 16 feet by 80 feet each, have been completed for Chicken Ranch, with concrete foundations and concrete floors with cement finish; all side and end walls and roofs have been painted; posts set and wire fencing placed for enclosing yards for each chicken house; buildings are now in use.

General State Work.

Connections have been made with main steam line for heating system at new Chapel; the 6-inch cast iron water pipe, in line from old reservoir to horse barn, has been taken up and the ditch back filled, there was approximately 1300 feet of pipe taken up and same will be used in the remodeling of the present domestic water system; range at Home restaurant has been overhauled and repaired; motor has been connected up for running centrifugal pump for pumping water from pond in front of Hospital for irrigating berry patch; connections have been made with pipe line from pump near Hospital for a water supply to garbage incinerator for fire protection; a 10 by 10 by 4-inch cast iron tee has been placed in main pipe line from Rector Canyon to Napa State Hospital, for a connection with line supplying this institution, this connection was necessary to secure for this Home an adequate water supply; several trips have been made along pipe line and repairs made where needed and it was found necessary to remove several lengths of pipe and replace same with new pipe.



ARRIVAL OF AIRPLANE.

QUARTERMASTER-COMMISSARY REPORT.

General SAMUEL W. BACKUS, *President, Board of Directors.*

(Through COL. NELSON M. HOLDERMAN, *Commandant.*)

SIR: I have the honor to submit herewith a report of the Quartermaster-Commissary for the fiscal year ending June 30, 1920.

This department embraces the farm, chicken and hog ranches, dairy, transportation, laundry, clothing, food and every feature pertaining thereto.

Supplies.

The contractors furnishing supplies to this institution have all conformed closely to the state specifications with the exception of a very few who attempted to send inferior goods, which goods were at once refused and returned to them at their expense.

Our supplies are purchased by the State Purchasing Department at Sacramento, California, and, under the new system, samples are submitted, before purchasing by the State Purchasing Department, and after being received at the Institution, samples are then forwarded to the State Board of Health at Berkeley for analysis, and if not found up to the standard are then rejected.

Employees.

The various departments under the supervision of the Quartermaster-Commissary employ seventy-two male and nineteen female employees, both civilians and members.

It has been difficult to get a desirable class of help owing to the scarcity and the difficulty of keeping in touch with the increase in pay that is set by commercial establishments.

In my report of last year, I called attention to the need of quarters for the civilian help, and again wish to call the attention of the members of the Board to the fact that it is especially difficult to obtain a good class of married help, necessary to fill certain positions. We hope to be able to secure funds at the next session of the Legislature with which to build these quarters.

Waste.

All garbage from the kitchens, dining rooms, restaurant, and residences is sent to the hog ranch, materially reducing the cost of feeding.

Old sacks, scrap iron, rubber or junk of any nature is sold to the junk dealers for the best prices obtainable.

Kitchen.

We have been very fortunate in securing good chefs in the main kitchen and our food has been well cooked and of a very good variety. With the aid of the State Nutrition Expert, Mr. Jaffa, our Bill of Fare will show that we have used a great deal of care in balancing the ration so that the Veterans have a desirable menu, the

workingmen being taken care of with a more substantial food or, in other words a food of higher protein. The tables are supplied daily with fresh fruit and fresh vegetables in season.

I am sorry to say that the funds that were set aside in the special appropriation, Chapter 442, Statutes 1919, for the rebuilding of the Main Kitchen were transferred to and used in making repairs of the quarters as the same were badly in need of these repairs and the kitchen was compelled to wait until more money was secured.

Main Dining Room.

It has been found necessary to replace the food carriers, which were of the carriage type, with an overhead system, running on a mono rail, because of the rough uneven condition of the floor and because of the old carriers being rubber tired they were continually breaking down and were a great expense in upkeep. At least we intended to replace them, but found that the roof construction was faulty and would not support this added weight. The State Engineering Department has advised that this roof be strengthened, immediately, and as soon as this work is completed, it will install this carrier.

Since the last report we have abolished the position of matron and find that with a head waitress who has charge of the waitresses and other employees of this department that we get far better results.

Fruits.

The prune crop this year not only furnished this Institution with enough dried fruit to carry the entire year, but about fourteen tons of very choice dried fruit was sold to other Institutions through the State Purchasing Department.

Apricots, peaches, pears and cherries were also furnished in abundance to the Main Mess, Hospital, and homes of the Institution. There were also an unusually large crop of blackberries and loganberries from the vines on the northern end of the grounds.

Farm.

This year has been especially a productive one from the standpoint of the hay crop, both volunteer and planted. We have so far cut and stored nearly two hundred and sixty-five ton, and still have about all of the alfalfa to cut. This will be the record crop of this place.

We have had a great deal of trouble and expense with the tractor trying to make it do our work and have finally decided to abandon this machine. The tractor company has asked for one more chance, to make good, which has been granted, at a conference with the Board of Control in Sacramento.

A great deal of valuable information has been received from the Farm Expert of the State Board of Control, Mr. F. L. Lathrop, who has always been willing and ready, when called upon, to either come or send good advice to this department.

Dairy.

This board has been enlarged considerably, since my last report, because none of the heifer calves have been butchered, and we find all of our herd at present in a very healthy condition. In a recent test given them by Dr. A. E. Duckworth, Deputy State Veterinarian, only two positive reactors out of the dry herd of fifty-six were found.

The milking machine has been installed and is doing splendid work. It is a machine that does not injure the udder, and not a case of garget has been found since the machine has been in use.

I wish to recommend that we purchase a pastuerizing machine so that the milk at all times can be pastuerized as a means of being sure that we are serving a milk free from any harmful bacteria. I also wish to recommend that we build a substantial silo and that an ensilage cutter be installed as a means of more properly and more economically feeding the herd.

Chicken Ranch.

We have completed two new hen houses from plans that have been approved by the poultry division of the State Farm at Davis. These houses have satisfied to some extent the much needed start on a reconstruction of the chicken yard. We have also built some fences in connection with these new houses and have reseeded and planted most of the ground.

The foreman and his assistant, Mr. Younger, are still making good, and their interest in all branches of this work is shown by the results obtained and the record made by this flock during the year.

Hog Ranch.

Under the watchful care and careful study by the foreman, Mr. McCray, this herd has increased to such an extent that today this Institution boasts of the finest herd of hogs of any of the State Institutions and they are all in a healthy condition.

We managed to secure a pedigree Tamworth boar from Russellville, Kentucky. A great improvement can be seen in the general condition of the young pigs. Before securing this new stock we were continually resorting to inoculations of vaccine in order to keep the herd in a healthy condition.

We are expecting to supply the hog ranch with Rector Creek water as soon as possible, which will go a long ways toward improving the conditions at this place. We are recommending that the rear of all pens be concreted with a drain, so that the young stock can be kept dry and clean until old enough to be turned in with the stock hogs.

Vegetable Garden.

The Home has been supplied by an abundance of first class vegetables of all varieties and the system used by the foreman, Mr. De Bendetti, resulted in keeping a supply of the most suitable vegetables for all seasons of the year.

Mr. Carey, the vegetable expert of the Davis School, stated, after a recent visit to the vegetable garden, that the vegetables were in a splen-

did, healthy looking condition and he had but few recommendations or suggestions to make as he stated that the vegetables, as grown, and the condition of the ground were beyond criticism.

This garden produces all of the vegetables used at this Institution except the potatoes and part of the onions. We have increased the production of a number of vegetables that can be canned, as per instructions of the State Board of Control, it being our intention to put up and store fruit and vegetables and tomato catsup in large quantities.

The Laundry.

This department has been badly handicapped because of the old dilapidated machinery, and the fact that most of the help used in this place is membership help, and this class of help has shown a decided drop in efficiency, and shows that before another annual report goes to press it will be absolutely necessary to discontinue using membership help in this department. We have managed to keep this plant going and have furnished the various departments with clean linen with great difficulty. There is, however, some relief in sight as we are about to install a new flat work ironer and a new extractor. We have been compelled to combine several positions in order to get our uniforms cleaned, pressed and tailored.

Shoe Repairing Shop.

We have experimented with neolin soles and rubber heels on some of the members, and the results show that neolin composition and rubber heels are not only less expensive than leather but are easier as footwear for the old men, and are in rainy weather to a certain extent water proof.

I wish to recommend that some shoe repairing machinery be installed so that our shoemaker could do all of the repairing that is necessary to be done; as it is we are compelled to let a contract at the present time to repair one hundred and fifty pairs of shoes, and this happens about every six months. These shoes, if resoled with neolin and the heels renewed with rubber heels, would give better satisfaction and it would pay the institution to do so.

Transportation.

In the past year we traded in the old Studebaker bus on a new Reo speed wagon, which has proved to be a very efficient bus for passenger transportation.

We have estimated for and been allowed a Dodge touring car with a trailer that will be used in making trips to the various institutions, and in the hauling of all light deliveries.

Respectfully submitted.

F. C. BUTLER,
Captain, Quartermaster-Commissary.

BILL OF FARE.

SUNDAY.

Breakfast.

Boiled eggs. Pork chops.
Boston baked beans. Bread.
Lyonnaise potatoes. Coffee.
Muffins and butter.

Dinner.

Chicken fricassee with
French dumplings. Creamed
carrots. Potatoes au gratin.
Combination salad. Choco-
late pudding. Bread and
coffee.

Supper.

Cold meat. Potato salad.
Pickled beets. Swiss
cheese. Peach pie. Tea.
Bread and butter.

MONDAY.

Breakfast.

Creamed chicken wings
with peas. Mutton chops.
Steamed potatoes. Biscuits.
Butter and coffee.

Dinner.

Hungarian goulash.
Creamed parsnips.
Steamed potatoes. Oyster
soup. Coffee. Bread. Butter.

Supper.

Beefsteak, gravy. Baked
potatoes. Rolled oats.
Bread. Coffee. Tea.
Butter. Apple sauce and
cake.

TUESDAY.

Breakfast.

Creamed codfish. Navy
style. Pork chops. Bayo
beans. Hotcakes. Corn
bread. Coffee. Bread
and butter.

Dinner.

Pot roast. Millanaise sauce.
Creamed onions. Brown
potatoes. Bread pudding.
vanilla sauce. Coffee.
Bread and butter.

Supper.

Mutton chops. Rolls.
Macaroni and cheese.
Fried potatoes.
Coffee. Tea. Butter.

WEDNESDAY.

Breakfast.

Boiled eggs. Navy beans.
Beefsteak. Bread. Butter.
Coffee.

Dinner.

Roast lamb, brown gravy.
Mashed turnips. Steamed
potatoes. Vermicelli soup.
Bread. Butter. Coffee.

Supper.

Cold meat. Pickled beets.
Sliced onions. Cornmeal
mush. Bread. Butter.
Coffee. Tea. Fruit.

THURSDAY.

Breakfast.

Lamb, curry with rice.
Mutton chops. Steamed
potatoes. Bread, butter and
coffee.

Dinner.

Irish stew, Dublin.
Creamed carrots. Steamed
potatoes. Farina pud-
ding. Bread. Butter.
Coffee and tea.

Supper.

Liver with onions. Fried
potatoes. Bread. Butter.
Tea. Stewed prunes.
Coffee. Coffee cake.

FRIDAY.

Breakfast.

Creamed salmon. Pork
chops. Lima beans.
Muffins. Butter. Coffee.

Dinner.

Baked halibut, maitre de
hote sauce. Creamed onions.
Steamed potatoes. Split
pea soup. Bread, butter
and coffee.

Supper.

Clam chowder. Steak and
gravy. Fried potatoes.
Spaghetti Italiano. Coffee.
Tea. Raisin buns.
Stewed peaches.

SATURDAY.

Breakfast.

Home-made pork sausage.
Bayo beans. Fried potatoes.
Biscuits. Butter. Coffee.
Hotcakes.

Dinner.

Corned beef and cabbage.
Steamed potatoes.
New England pudding.
Coffee. Bread. Butter.

Supper.

Cold meat. Sliced onions.
Pickled beets. Rice and
milk. Cake. Tea. Stewed
apricots. Bread, butter
and coffee.

Sugar, mustard, vinegar, pickles and sauces on tables at all times.

Fresh fruit and vegetables when received from Farm.

Fricassee meats on mush tables.



LIBRARY

REPORT OF THE ADJUTANT.

VETERANS' HOME, July 1, 1920.

*To the President and Board of Directors,**Veterans' Home of California.*(Through COL. NELSON M. HOLDERMAN, *Commandant.*)

GENTLEMEN: I have the honor to submit herewith statement showing statistics of membership of the Veterans' Home of California, together with descriptive list of all members present on June 30, 1920, for the fiscal year ended June 30, 1920.

STATISTICS.

Membership of Home, June 30, 1919	-----	657
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New admissions during the year:

Survivors of Civil War	-----	84
Survivors of Indian Wars	-----	10
Survivors of Spanish-American War	-----	53
Survivors of American Expeditionary Forces	-----	1
Survivors of Mexican Border	-----	2
Survivors of Foreign Service	-----	2

Total admissions	-----	152
By readmission	-----	290

Total gain	-----	442
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Losses during the year:

By discharge, own request	-----	264
By dropped, committed to insane asylum	-----	3
By dropped, non-eligible	-----	3
By dropped, absent without leave	-----	25
By dropped, not renewing furlough	-----	22
By death	-----	94

Total loss	-----	411
Net gain	-----	31

Membership of Home June 30, 1920	-----	688
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Segregation as to wars:

Civil War	-----	460
Indian Wars	-----	45
Spanish-American War	-----	177
Foreign Service	-----	6

Total	-----	688
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Average present during the year	-----	598.2
Average present and absent during the year	-----	678.1
Average absent with leave	-----	76.1
Average absent without leave	-----	3.8
Average sick in Hospital	-----	117
Average age of members admitted	(years) -----	66.6
Average age of Civil War Veterans	(years) -----	75
Average age of Indian War Veterans	(years) -----	69.75
Average age of Spanish-American War Veterans	(years) -----	57.36
Average age of Foreign Service Veterans	(years) -----	63.5
Average age of all living members	(years) -----	72.67
Average age of all members dying during the year	(years) -----	72.4
Total admissions to June 30, 1920	-----	7638
Highest number present during the year	-----	672
Highest number present and absent during the year	-----	747
Average temporary at post	-----	9

Average number sick, with leave, without leave, present, present and absent, whole number cared for, gain and loss, at Veterans' Home of California from June 30, 1890, to June 30, 1920.

During the year ending June 30	Average sick	Absent with leave	Absent without leave	Average present	Average present and absent	Whole number cared for	Gain			Loss					
							By admission	By readmission	Total	By discharge	By summary discharge	By dishonorable discharge	By dropped from roll	By death	Total
1890	25	32	2	203	236	304	136	9	145	42		14	23	17	96
1891	31	49	3	233	279	361	192	17	209	59		5	25	23	112
1892	122	75	7	334	416	542	308	56	364	116		20	68	44	248
1893	163	104	9	411	524	561	228	83	311	123		16	68	32	239
1894	44	48	11	416	475	502	291	114	405	348		30	62	42	492
1895	43	34	6	442	482	516	263	203	466	277		34	51	35	397
1896	48	47	8	553	588	588	275	224	499	300		36	28	51	415
1897	50	40	11	600	651	651	257	198	455	229	25	11	68	42	375
1898	74	51	11	624	686	686	197	189	386	247	47	5	60	30	397
1899	103	48	13	674	735	735	206	246	452	168	17	2	105	51	373
1900	115	66	17	689	772	772	186	218	404	218	19	3	133	68	441
1901	128	70	15	703	788	788	189	225	414	153	10	4	120	74	361
1902	128	71	14	735	820	820	186	199	385	214	43	4	88	60	409
1903	116	104	12	709	825	825	193	201	394	124	59	2	45	76	306
1904	124	141	20	726	887	887	197	175	372	146	37		69	75	327
1905	127	140	25	730	895	895	215	166	381	130	65	1	97	72	365
1906	143	115	11	764	895	895	180	200	380	265	76	1	82	70	494
1907	135	86	6	721	813	813	131	192	323	15	26	2	31	88	328
1908	139	85	10	761	856	856	223	214	437	120	50	3	78	94	345
1909	160	120	10	834	971	971	268	181	449	119	31	6	68	120	334
1910	159	179	13	855	1047	1049	273	164	437	131	20	2	105	86	344
1911	178	228	16	925	1169	1180	324	154	478	275	6	5	69	133	440
1912	208	159	15	982	1156	1164	292	209	501	310	3	1	93	107	514
1913	208	130	10	944	1084	1094	259	278	537	339	13	2	150	120	624
1914	195	117	11	912	1041	1054	294	299	593	321	3	4	102	139	569
1915	214	84	7	972	1033	1068	340	304	614	365	2	3	132	136	638
1916	211	83	8	936	1020	1031	228	247	475	319			101	183	553
1917	208	88	6	878	974	980	244	231	475	333			73	134	540
1918	204	82	7	777	863	871	218	222	440	421			78	110	610
1919	134	73	6	622	701	710	185	277	462	348			64	141	553
1920	117	76	4	598	678	687	152	290	442	264			53	94	411

Nativity.

Native born	4794
Foreign born	2844

Nativity of Foreign Born.

Australia	2	Italy	2
Austria	25	Mexico	1
Azores	1	New Brunswick	2
Belgium	1	Norway	33
Canada	176	Nova Scotia	15
Denmark	64	Poland	13
England	264	Portugal	1
Finland	2	Prussia	27
France	70	Russia	3
Germany	622	Scotland	99
Hawaii	1	Sweden	94
Holland	3	Switzerland	47
India	1	Wales	14
Ireland	1241	Scattering	19

Total number admitted 7638, and readmitted, 6372, making a total of 14,010 since the organization of the home.

Respectfully submitted.

CAPTAIN S. M. MONTGOMERY,
Adjutant.

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA.

Name	Company and regiment	Rank	Length of service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Allen, Hiram	A, 5th Wis. Inf.	Private	44	Michigan	71	\$40 00	Rheumatism	Jan. 23, 1917
Anderson, Andrew	C, 6th Cal. Vol. Inf.	Private	8	Norway	47		Fracture both arms	Sept. 25, 1913
Anderson, Jacob F.	B, 71st Pa. Inf.	Private	24	Indiana	80	40 00	Delirium of age	June 30, 1920
Anderson, Louis	E, 6th Cal. Vol. Inf.	Private	7	Norway	52		Kidney and bladder trouble	April 13, 1914
Anderson, Peter	U. S. Navy	Coxswain	35	Sweden	55		Rheumatism	April 27, 1914
Annis, Charles	F, 2d Mass. Inf.	Private	11	Massachusetts	63	38 00	Infective vision	Aug. 2, 1904
Anspack, Henry	I, 7th Cal. Inf.	Private	17	Germany	77	35 00	Nervousness, age	Mar. 13, 1917
Armstrong, James J.	K, 4th Tex. Vol. Inf., etc.	Private	48	Scotland	40	10 00	Heart disease	Mar. 16, 1904
Arnold, Carl G.	C, 4th U. S. Inf.	Private	36	Germany	73	20 00	Age	Mar. 27, 1919
Ashefelder, Frank M.	U. S. Marine Corps	Private	48	Pennsylvania	32		Lumbar	Sept. 18, 1911
Atterton, George B.	G, 18th U. S. Inf.	Private	35	New York	59		Hernia	Oct. 9, 1912
Atterbury, James D.	C, 43d Mo. Inf.	Corporal	11	Missouri	56	32 00	Varicose veins	Sept. 18, 1901
Atwood, Armstrong A.	B, 4th Mich. Cav.	Private	18	Michigan	68	30 00	Bronchial trouble	Mar. 19, 1914
Austin, Charles G.	Bat. A, 1st Batn. Cal. H. A.	Private	16	Ohio	46		Heart disease	April 27, 1913
Bacigalupi, Charles	G, 6th Cal. Inf.	Private	24	Italy	77	40 00	Injury left shoulder	June 17, 1916
Badger, James W.	B, 1st Wash. Vol. Inf.	Private	14	Ohio	53		Dysentery	April 16, 1913
Baer, Albert	K, 47th Pa. Inf.	Private	1	Pennsylvania	68		Hernia	Nov. 21, 1914
Baer, Robert E.	A, 1st N. D. Vol. Inf.	Private	16	Minnesota	38		Injured back	Oct. 28, 1912
Bailey, Joseph L.	A, 4th N. Y. H. A.	Private	22	New York	65	40 00	Rheumatism; broken ribs	Jan. 6, 1910
Bail, Thomas P.	D, 152d Ind. Inf.	Private	7	Ohio	63	30 00	Rheumatism	Jan. 30, 1914
Baltz, Henry W.	A, 23d Pa. Militia	Private	4	Pennsylvania	62	30 00	Crippled hand and shoulder	April 27, 1905
Barnard, Charles N.	1st Bat. Mass. Lt. A.	Private	4	Massachusetts	89	30 00	Age	June 5, 1920
Barnhart, James	F, 172d Pa. Inf., etc.	Corporal	23	Pennsylvania	53	40 00	Gunsight wound right breast	July 17, 1897
Barnes, Joseph	B, 13th Wis. Inf.	Private	37	Pennsylvania	75	40 00	Lumbar	April 11, 1920
Barrowsky, Henry	C, 169th N. Y. Inf.	Private	5	New York	62	30 00	General debility	June 5, 1901
Barringer, David	M, 2d Mich. Cav.	Private	48	Germany	62	40 00	Lung trouble	Jan. 17, 1906
Bauer, George J.	M, 1st U. S. Cav.	Sergeant	167	Pennsylvania	65	20 00	Aortic regurgitation	Jan. 8, 1919
Beamer, Sobieski	B, 1st Mich. Lt. A.	Private	21	Michigan	79	40 00	Age; rheumatism	Sept. 16, 1919
Beard, James	I, 34th Iowa Inf.	Private	36	Indiana	63	40 00	Injury to head	Feb. 6, 1895
Beecraft, William R.	I, 11th Mo. Cav.	Bugler	40	Missouri	80	40 00	Age	April 7, 1920
Belk, John C.	D, 14th Kans. Cav.	Sergeant	38	Missouri	66	40 00	Tumor	Oct. 9, 1912
Bell, Charles H.	D, 1st Maine Cav.	Sergeant	46	Maine	51	40 00	Gunsight wound	April 13, 1894
Bell, Daniel	E, 9th Ohio Cav.	Private	22	Canada	69	38 00	Injury to leg	Sept. 21, 1914
Beknap, Seba	H, 57th Wis. Inf., etc.	Private	8	New York	67	30 00	Stomach trouble	May 5, 1914
Bentz, John H.	H, 15th N. Y. Cav.	Private	19	Germany	69	32 00	Paralysis	July 7, 1916
Bergman, Peter	A, 5th Mo. Cav., etc.	Private	35	Missouri	61	40 00	Rheumatism	June 17, 1913

Berno, August J.	F, 20th U. S. Inf.	Private	Illinois	36	47	Broken knee	June 3, 1918
Beuter, Julius	A, 18th U. S. Inf.	Private	Pennsylvania	36	70	Loss of leg	May 7, 1919
Bevert, William L.	D, 8th Cal. Inf.	Corporal	Georgia	10	76	Blind	July 11, 1911
Birdsall, Arthur H.	F, 7th Ohio Vol. Inf.	Private	Pennsylvania	5	44	Rheumatism	Jan. 22, 1919
Birdsall, John A.	M, 10th Minn. Inf., etc.	1st Sergeant	Canada	44	59	Blindness	Mar. 11, 1899
Bittner, Louis	D, 1st Nev. Vol. Inf.	Private	Germany	33	43	General debility	July 8, 1907
Bliss, Clarence P.	H, 56th Ohio Inf.	Private	Ohio	13	76	Age	Jan. 16, 1917
Blodgett, Charles E.	H, 18th N. H. Inf.	Private	Vermont	9	64	Broken right arm	June 25, 1911
Bloomer, Reuben, alias J. S. Bloomer	G, 2d N. Y. Cav.	Corporal	New York	51	75	Age	Dec. 8, 1915
Bohler, Jacob, alias Jacob Barth	A, 7th N. Y. Inf.	Private	Germany	16	75	Age	July 24, 1887
Boland, Martin	A, 2d Minn. Cav.	Private	Illinois	24	71	Age; rheumatism	Dec. 31, 1919
Boon, Thomas N.	B, 6th U. S. Inf.	Private	Missouri	16	42	Broken ribs	Sept. 18, 1915
Bourquin, Auguste E.	K, 1st Mo. Lt. Art.	Private	France	26	77	Loss left leg	Sept. 18, 1917
Bouss, William R.	H, 37th N. J. Inf.	Private	New York	3	56	Disease of rectum	Dec. 10, 1901
Bowles, John J.	A, 3d Md. Inf.	Corporal	Maryland	37	71	Age	Sept. 9, 1915
Boyd, Anderson	A, 1st Mo. Cav.	Private	Missouri	22	67	Rheumatism	Oct. 12, 1907
Boyd, Hugh	U. S. Navy	Coal Passer	Ireland	31	42	Varicose veins	Oct. 19, 1919
Boyer, Francis	U. S. Navy	Landman	Massachusetts	36	64	Rheumatism	Dec. 23, 1912
Boynton, Clyde	F, 2d Ore. Vol. Inf.	Private	Illinois	16	58	Stomach trouble	Mar. 5, 1919
Brady, Edward	U. S. Mil. Acad., Art. Det.	Private	Ireland	26	66	Rheumatism	Dec. 30, 1901
Brand, Robert	K, 15th Ill. Inf.	Private	Canada	5	75	Hemorrhoids; age	Nov. 13, 1913
Brant, William F.	F, 12th U. S. Inf.	Private	Pennsylvania	76	69	Loss three fingers right hand	June 25, 1911
Brantley, Robert L.	B, 81st Ill. Inf.	Private	Kentucky	12	63	Indigestion	July 13, 1912
Brasher, Robert W.	M, 2d U. S. V. Cav.	Private	Nevada	6	47	Lameness; feet and legs	Jan. 13, 1917
Briddy, Philip	A, 69th N. Y. Inf.	1st Sergeant	Ireland	27	52	General debility	Jun. 7, 1814
Brodie, Angus A., alias St. John	43d U. S. V. Inf.	Drum Major	Scotland	29	73	Rheumatism	Aug. 23, 1908
Brooks, John P.	G, 6th Ind. Cav.	Corporal	Indiana	24	71	Partial paralysis	June 21, 1917
Brown, Benjamin	Band, 24th U. S. Inf.	Corporal	Missouri	34	56	Weak eyes	Jan. 12, 1915
Brown, Eli R.	F, 16th Pa. Res. Inf.	Private	Pennsylvania	26	78	Age	June 22, 1920
Brown, Samuel B.	K, 137th U. S. C. Inf.	Private	Georgia	9	87	Age	Feb. 5, 1919
Brown, Samuel B.	F, 19th Pa. Inf.	1st Sergeant	Pennsylvania	20	72	Gunsight wound	Mar. 21, 1911
Bruce, Napoleon B.	B, 15th Mass. Inf.	Private	New York	32	79	Injury left leg	Dec. 12, 1919
Bryan, Edward	U. S. Navy	Master-at-Arms	Ireland	35	67	Age	Dec. 16, 1910
Bryant, Arthur D.	E, 8th Cal. Inf.	Private	Wisconsin	7	68	Rheumatism	July 16, 1917
Buchanan, Joseph R.	I, 5th Ill. Cav.	Private	Illinois	20	78	Age; blind	Jan. 17, 1914
Buck, Charles W.	F, 9th U. S. Inf.	Musican	New York	26	46	Lung trouble	Dec. 2, 1916
Buckman, Gilbert	L, 1st Vermont Cav.	Bugler	Canada	13	77	Rheumatism	June 26, 1906
Ballard, William	G, 2d Mass. Cav.	Sergeant	England	28	67	Lumbago	Feb. 7, 1911
Bumsted, Edwin	A, 2d N. Y. Cav.	Saddler	New York	34	77	Bladder trouble	Feb. 5, 1918
Bundy, William	F, 116th Indiana Inf.	Private	Indiana	7	62	Stomach trouble	Feb. 5, 1910
Burdick, Stephen F.	C, 6th N. Y. Inf.	Corporal	N. Y. York	16	67	Rheumatism; cataracts	Jan. 26, 1896

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Burke, Edward J.	F, 1st Mo. Lt. Art.	Private	37	Ireland	71	40 00	D-a-fress	Oct. 15, 1913
Burke, John	L, 20th N. Y. Cav.	Private	21	Ireland	69	38 00	Rheumatism	Nov. 20, 1914
Burns, John, No. 3	U. S. Navy	Landsman	14	Ireland	72	35 00	Rheumatism	May 26, 1910
Burns, William, No. 2	U. S. Navy	Coxswain	88	England	38		Malaria	Dec. 16, 1911
Byron, Frederick W.	C, 21th Pa. Cav.	Private	7	Pennsylvania	67	32 00	Rheumatism	July 12, 1906
Byron, James	U. S. Navy	2d Cl. Boy	18	Rhode Island	58	35 00	Rheumatism	Oct. 2, 1905
Cagney, William	A, 2d U. S. Cav.	Sergeant	36	Ireland	65	20 00	Stomach trouble	Feb. 14, 1910
Callahan, James W.	L, 20th Ohio Cav.	Private	22	Ohio	69	30 00	Painter's colic	July 9, 1917
Callaghan, Peter C.	D, 20th U. S. Inf., etc.	Private	60	Connecticut	61	20 00	Rheumatism	Mar. 21, 1911
Cameron, John, No. 3	U. S. Navy	Oiler	72	Scotland	61		Kidney trouble	Jan. 13, 1914
Camp, James J.	F, 2d N. C. Mtl. Inf.	Private	23	N. Carolina	75	38 00	Age	Oct. 22, 1894
Campion, William	A, 188th Pa. Inf.	Ord. Seaman	43	New Jersey	54	40 00	Varicose veins	Dec. 15, 1919
Card, Oren M.	E, 82d Pa. Inf.	Private	12	New York	76	35 00	Chronic rheumatism	Apr. 19, 1912
Carels, John H.	E, 82d Pa. Inf.	2d Lieutenant	37	Pennsylvania	81	40 00	Age	July 15, 1895
Carroll, George H.	H, 29th Mass. Inf.	Private	13	Massachusetts	68	35 00	Lung trouble	July 24, 1897
Cart, John	F, 65th N. Y. Inf.	Private	46	Ireland	58	40 00	Injury to shoulder	Nov. 12, 1899
Carson, Patrick	I, 10th Mo. Cav.	Private	19	Iowa	57	38 00	Bronchitis	Dec. 21, 1907
Case, John J.	B, 4th Mo. Cav.	Corporal	49	Missouri	65	40 00	Age	Dec. 25, 1912
Chalker, William	K, 1st U. S. Inf., etc.	Sergeant	225	New York	61	30 00	Hernia	Dec. 23, 1893
Chambers, James	U. S. Navy	Seaman	13	Pennsylvania	54	35 00	Loss left arm	July 13, 1918
Chatten, George	A, 13th U. S. Inf., etc.	Sergeant	44	New Jersey	44		Partial blindness	April 20, 1912
Chesley, George H.	U. S. Marine Corps	Private	15	Nebraska	31	24 00	Dislocated right hip	Jan. 26, 1895
Clark, Andrew P., alias Anthony P. Clair	H, 1st Vermont Cav.	Private	39	New York	51	40 00	Rheumatism	Dec. 16, 1903
Clark, Henry H.	G, 7th Cal. Inf.	Private	20	Michigan	58	38 00	Rheumatism	Feb. 9, 1920
Clark, Robert G.	F, 3d N. Y. Vol. Inf., etc.	Private	46	New York	47	24 00	Chronic rheumatism	Jan. 1, 1918
Clark, William D.	H, 17th Ind. Inf.	Private	33	Indiana	75	40 00	Age	May 22, 1920
Clay, John	D, 20th Wis. Inf.	Private	34	New York	76	40 00	Rheumatism	Oct. 31, 1901
Clay, William B., alias James Keane	I, 1st Ill. Lt. Art.	Private	17	Kentucky	57	35 00	Loss of voice; frac. rt. arm	July 23, 1918
Clement, Lyman H.	H, 4th Vermont Inf.	Private	7	Vermont	78	32 00	Hernia	Jan. 31, 1901
Cliner, Martin, alias Cuhler	C, 3d N. J. Cav.	Private	19	Pennsylvania	57		Hemorrhage of lungs	Nov. 18, 1919
Clunen, James	B, 47th U. S. V. Inf.	Private	22	Massachusetts	57		Hernia; rheumatism	Apr. 23, 1920
Colburn, Levi	G, 15th Mich. Inf.	Private	5	New York	79	30 00	Age	June 11, 1915
Cole, George	F, 4th Mass. Art.	Private	12	Maine	60	32 00	Fracture of leg	Feb. 19, 1919
Collins, Matthew M.	H, 7th Cal. Vol. Inf.	Private	7	Iowa	63		Lame feet	

Conaty, Andrew M.	E, 9th U. S. Inf.	Private	36	Illinois	79	Age	July 7, 1919
Collins, William L.	F, 10th Mass. Inf.	Private	17	Massachusetts	55	General debility	Sept. 9, 1883
Conklin, James M.	E, 14th Ill. Inf.	Private	37	England	78	Age	Sept. 5, 1917
Connolly, Joseph P.	D, 8th N. J. Inf.	Private	48	New York	62	Rheumatism	Sept. 14, 1904
Cook, Peter	B, 4th U. S. V. Inf.	Private	12	Ireland	56	Rupture	Sept. 6, 1912
Cooley, Jonathan L.	D, 7th Cal. Inf.	Private	16	Germany	74	Impaired vision	Dec. 17, 1905
Cooper, George C.	F, 6th Tenn. Cav.	Private	14	Tennessee	49	Gunshot wound right hip	Dec. 5, 1894
Corbett, John	C, 17th Ind. Inf., etc.	Private	44	Indiana	64	Rheumatism	April 30, 1902
Colton, Nathaniel W.	U. S. Marine Corps	Private	60	Ireland	47	Broken hip	Oct. 28, 1909
Corbett, John	G, 4th Cal. Inf.	Private	36	Ireland	73	Stomach trouble	Aug. 9, 1913
Corbett, John	B, 10th U. S. Inf.	Private	35	Missouri	48	Ataxia both legs	May 15, 1910
Corbett, John	F, 13th Ohio Inf., etc.	Corporal	37	Ohio	83	Age	April 12, 1920
Corbett, John	K, 41st Ohio Inf., etc.	Private	17	Ohio	58	Rheumatism	Jan. 8, 1901
Corbett, John	E, 142d Ill. Inf., etc.	Private	30	Illinois	63	Crippled hand	Oct. 3, 1910
Courtright, John R.	L, 2d Neb. Cav.	Private	9	Missouri	71	Age	April 29, 1918
Cowan, William A.	I, 2d Ia. Inf.	Private	4	Louisiana	68	Neurasthenia	Aug. 2, 1912
Cox, George W.	C, 79th Ill. Inf.	Private	35	Illinois	68	Broken right leg	Nov. 5, 1914
Coyne, James A.	E, 9th U. S. Inf.	Private	54	New York	64	Broken right leg	Aug. 2, 1912
Crane, Edward	F, 1st Mass. Cav.	Private	21	New Hampshire	75	Age	Nov. 12, 1917
Crawford, James L.	12th Mass. Lt. Batty	Private	31	Maine	60	Kidney trouble	Aug. 22, 1917
Cummings, Charles W.	E, 9th U. S. Inf.	Private	76	Ireland	69	Rupture	Dec. 17, 1904
Cummings, William	I, 1st Neb. Cav.	Private	18	Pennsylvania	65	Rheumatism	July 17, 1910
Curtin, John	U. S. Navy	Ord. Seaman	13	New York	66	Rheumatism	Sept. 27, 1910
Curtis, Francis A.	K, 4th Mass. Cav.	Private	33	Massachusetts	50	General debility	April 4, 1912
Cushing, John	C, 151 Ill. Inf.	Private	11	Missouri	65	Partial paralysis right arm	Nov. 29, 1897
Cushing, Nathaniel	E, 18th U. S. Inf., etc.	Private	72	Ireland	32	Malaria; stomach trouble	Jan. 13, 1915
Danford, Jay	C, 134 Ill. Inf.	Private	6	New York	32	Age	Jan. 14, 1908
Daniels, Charles	F, 1st Cal. Vol. Inf.	Private	15	California	76	Gunshot wound right leg	Oct. 14, 1900
Daniels, Louis J.	Hospital Corps, U. S. A.	Private	36	Ohio	44	Dysentery	Jan. 24, 1913
Daum, Henry	M, 49th U. S. V. Inf.	Private	20	Ohio	42	Epilepsy	June 14, 1920
Davis, Calvin L.	A, 1st Ida. Vol. Inf.	Private	26	N. Carolina	45	Locomotor ataxia	Feb. 4, 1918
Davis, Edwin A.	B, 24th N. Y. Inf.	Private	21	Pennsylvania	48	Piles	Oct. 6, 1908
Davis, George Alfred	K, 16th U. S. Inf.	Private	39	Germany	60	Injury right hip	Oct. 27, 1897
Davis, Homer S.	D, 2d Minn. Inf.	Private	6	New York	36	Kidney trouble	Mar. 20, 1914
Davis, Preston R.	G, 6th Mass. Inf., etc.	Private	8	Pennsylvania	81	Age	April 18, 1917
Dawson, Thomas	I, 9th Minn. Inf.	Private	27	Vermont	69	Rheumatism	Dec. 1, 1913
Dean, Charles F.	C, 129th Ohio Inf.	Private	8	Kentucky	89	Age	Mar. 24, 1920
Dearborn, Charles	E, 5th U. S. Cav.	Private	32	Ohio	57	Scurvy	Dec. 13, 1899
de Jarnac, Edmund	A, 13th U. S. Inf.	Sergeant	37	England	73	Rheumatism	Feb. 8, 1917
Delaney, Francis, alias Francis Riley	H, 2d U. S. Inf.	Private	11	Ohio	67	Rupture; general debility	Sept. 28, 1914
	Band, 8th U. S. Inf., etc.	Musican	120	Kentucky	57	Rheumatism	Mar. 10, 1911
	U. S. Navy	Landsman	12	France	67	Varicose veins	July 12, 1914
				Ireland	65	Rheumatism	Dec. 16, 1910

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Denison, George W.	B, 84th N. Y. Inf.	Private	4	New York	74	38 00	Rheumatism	Oct. 30, 1919
Demick, George V.	A, 122d Ohio Inf.	Private	26	Ohio	56	40 00	Piles; gunshot wound.	Nov. 28, 1901
Dewey, John	B, 36th U. S. Inf.	Private	33	Ireland	67	20 00	Rheumatism	Mar. 2, 1909
Dickerson, George M.	D, 2d Ill. Lt. Art.	Private	37	New York	73	40 00	Age	Dec. 21, 1915
Dickey, Herbert V.	B, 22d Maine Inf., etc.	Private	14	Maine	63	40 00	Rheumatism	Sept. 21, 1911
Dickson, David	F, 12th Mo. Cav.	Private	18	Missouri	69	38 00	Heart trouble	June 18, 1915
Dickson, William	D, 9th U. S. Vol.	Private	49	Scotland	70	40 00	Rheumatism	Dec. 13, 1907
Diehl, John A.	B, 51st Ohio Inf., etc.	1st Lieutenant	10	Ohio	75	32 00	General debility	June 15, 1911
Dings, James M.	C, 8, Navy	Seaman	18	New York	75	35 00	Rheumatism	June 11, 1915
Dicks, Henry	B, 1st Bat. Nat. Cal. Cav.	1st Sergeant	25	Germany	77	40 00	Paralysis	June 11, 1916
Dixson, Frank J.	C, 22d U. S. Inf., etc.	Private	37	England	63		Asthma	Mar. 2, 1905
Dodd, James	C, 8, Navy	Landisman	39	Massachusetts	50	38 00	Rheumatism	June 4, 1891
Doerr, Henry	I, 23d Conn. Inf., etc.	Private	14	Germany	74	35 00	Rheumatism; age	Aug. 19, 1919
Dolan, Patrick	A, 5th U. S. Cav.	Private	35	Ireland	56	40 00	General debility	Nov. 10, 1894
Donlon, Dennis G.	U. S. Navy	Ord. Seaman	10	Ireland	63	30 00	Lumbago	Dec. 13, 1910
Donahoe, William J.	I, 14th Ill. Cav.	Private	18	Ohio	63	35 00	Swollen right arm	Oct. 8, 1912
Doolay, Daniel C.	C, 11th U. S. Inf., etc.	Sergeant	32	Ireland	40		Blind poisoning	Sept. 2, 1911
Dority, Henry W.	Unassigned, 19th Maine Inf.	Private	2	Maine	49	12 00	Blood	Dec. 21, 1895
Doxley, John	H, 36th U. S. V. Inf.	Private	18	New York	49	6 00	Malaria	Mar. 7, 1907
Draper, Thomas D.	H, 4th Cal. Inf.	Private	36	New York	65	40 00	General debility	May 14, 1859
Drummond, Benjamin	D, 7th Cal. Inf.	Private	19	Illinois	62	30 00	Rheumatism	Dec. 15, 1909
Dunfee, Charles H.	D, 1st Cal. Vol. Inf.	Private	16	Indiana	59		Lumbago	Nov. 21, 1915
Dunn, Michael, alias Joseph Smith	U. S. Navy	Landisman	25	Louisiana	65	40 00	Broken ribs	Mar. 11, 1909
Dushane, Jesse P.	K, 16th Pa. Inf.	Private	32	Pennsylvania	74	40 00	Age	April 15, 1916
Dwyer, Michael	H, 4th Cal. Inf.	Private	20	Ireland	68	38 00	Rheumatism	June 1, 1865
Dwyer, Patrick	F, 1st U. S. Inf.	Private	50	Ireland	54	12 00	Crippled right leg	April 6, 1911
Dwyer, Joseph D.	U. S. Navy	Seaman	51	Ireland	55	38 00	Kidney disease	May 15, 1892
Dyer, Spencer J.	K, 5th U. S. C. H. Art., etc.	2d Lieutenant	40	Ohio	78	40 00	Age	April 8, 1929
Edgerly, Richard	D, 7th Maine Inf.	Private	8	Maine	75		Age	June 29, 1915
Edwards, Edwin	K, 5th Minn. Inf.	Corporal	12	Norway	77	35 00	Blind	Feb. 1, 1919
Edwards, Shepard D.	C, 17th Maine H. A.	Private	24	Maine	72	40 00	Injury to back	April 29, 1915
Eichelberger, John C.	H, 2d Iowa Inf.	Sergeant	33	Pennsylvania	74	40 00	Rheumatism	May 13, 1892
Elliott, Henry	M, 11th U. S. Vol. Cav.	Private	18	Maryland	57		Asthma	Jan. 5, 1916
Elliott, John J.	E, 12th Ky. Inf.	Private	30	Kentucky	73	46 00	Age	Oct. 13, 1916
Esses, George Jacob	K, 18th Ohio Inf.	Private	5	Ohio	71	40 00	Loss right foot	Feb. 23, 1915

Estabrook, William W.	B, 1st Nev. Inf.	Private	24	New Hampshire.	47	38 00	Rheumatism	Aug. 23, 1891
Evans, John W.	U. S. Navy	Carpenter's Mate	32	New York	47	38 00	Deafness	July 18, 1911
Evans, Luke	G, 22d N. Y. Inf.	Private	18	New York	74	38 00	Kidney trouble	June 21, 1950
Evarts, Aranthus	B, 8th Ill. Cav.	Private	7	Iowa	60	32 00	Rheumatism	Dec. 23, 1904
Fahay, Michael	E, 7th U. S. Inf.	Private	34	Ireland	75		Rupture	May 8, 1914
Fales, Charles E.	K, 9th N. Y. Inf., etc.	Private	71	Maryland	51		Deafness	July 8, 1915
Fehland, Charles	I, 1st Cal. Inf.	Private	15	Germany	57		Bronchitis	Aug. 16, 1912
Ferera, Eugene	Cas. Det. Coast Art.	Private	36	Italy	43		Tuberculosis	Oct. 9, 1912
Fields, Anthony	D, 1st Maine Inf.	Private	38	Maine	74	40 00	Paralysis	May 28, 1913
Fields, James	D, 17th Ill. Cav.	Private	25	Missouri	72	40 00	Rheumatism	Dec. 30, 1918
Filmer, Edmund L.	B, 1st Cal. Vol. Inf.	Private	49	Massachusetts	49		Malaria	Dec. 5, 1918
Fitzgerald, Nathan W.	A, 132d Ind. Inf.	Private	4	Indiana	76	30 00	Age	Nov. 11, 1919
Flood, James	B, 8th Mass. Inf.	Private	4	New York	71	30 00	Age	Sept. 13, 1916
Flynn, Edmund W.	I, 5th Wis. Inf.	Private	39	New York	55	40 00	Gunshot wound right arm	July 6, 1894
Follett, Thomas M.	H, 34th Iowa Inf.	Private	36	Canada	72	40 00	Age	April 27, 1907
Fonda, Abner S.	A, 7th Vermont Inf.	1st Lt. and Q. M.	51	Vermont	69	40 00	Bronchitis; hernia	Mar. 15, 1910
Ford, Jackson	K, 34th Iowa Inf.	Private	9	West Virginia	86	30 00	Age; bad legs	Dec. 16, 1919
Foster, Andrew H.	F, 1st Mich. Lt. Art.	Private	18	New York	69	33 00	Cough	Sept. 9, 1912
Foster, Charles F.	M, 14th U. S. Inf.	Private	36	Kansas	50		Sore feet	July 7, 1916
Fowler, Harvey	I, 2d Cal. Inf.	Private	15	Missouri	68	35 00	Total blindness	Dec. 15, 1914
Fowler, Joseph L.	D, 28th U. S. V. Inf.	Private	21	Pennsylvania	38		Varicose veins	July 27, 1914
Francisco, Benjamin L.	C, 21st Mich. Inf., etc.	Private	29	New York	67	40 00	Heart disease	July 10, 1909
Frazier, Thomas J.	K, 150th Ohio Inf.	Private	3	Ohio	74	30 00	General debility	July 11, 1916
Frear, Chauncey E.	L, 6th N. Y. H. Art.	Private	24	New York	54	40 00	Rheumatism	April 22, 1893
Freil, John J.	B, 1st U. S. Inf., etc.	Private	62	Ireland	40	24 00	Rheumatism	Nov. 12, 1902
Frost, Samuel	E, 14th Iowa Inf.	Private	37	Iowa	77	40 00	Stomach trouble	Feb. 17, 1920
Fuchs, Herman	A, 1st Idaho Vol. Inf.	Private	16	Austria	59		Sprained back	July 1, 1913
Gallagher, James	U. S. Navy	Seaman	36	New York	80	35 00	Old age	May 18, 1912
Gallagher, John	G, 14th U. S. Inf.	Private	25	Massachusetts	43		Neuralgia	Sept. 20, 1910
Gallagher, John F.	F, 35th U. S. Vol. Inf.	Private	21	Massachusetts	47		Tuberculosis	Dec. 16, 1910
Gallagher, Thomas	K, 15th N. Y. Cav.	Private	18	Ireland	52	40 00	Deafness	Oct. 6, 1857
Galloway, Joseph McCann	E, 8th Minn. Inf.	Private	15	New York	64	35 00	Rheumatism	Mar. 24, 1904
Gavin, Timothy F.	A, 7th Ill. Vol. Inf., etc.	Private	60	Ireland	50		Rheumatism	Dec. 17, 1913
Geinti, John P.	G, 19th Ill. Inf.	Private	2	Wisconsin	76		Dislocated shoulder	June 28, 1923
George, William H.	24th Ky. Inf.	Q. M. Sergt.	40	Kentucky	78	40 00	Age	Jan. 9, 1918
Geran, Anthony	E, 4th Cal. Inf.	Private	41	California	45	20 00	Rheumatism	Dec. 18, 1883
Gibbs, William	K, 7th U. S. Cav.	Private	40	England	62	20 00	Nephritis	Jan. 11, 1910
Gibson, John E.	G, 8th Mich. Inf., etc.	Private	37	Michigan	76	40 00	Rheumatism	June 25, 1919
Gilbert, Horace B.	F, 30th N. Y. Inf.	Sergeant	48	New York	66	40 00	Blind	June 13, 1907
Gill, Marvin	F, 2d Neb. Cav.	Private	3	Pennsylvania	83	32 00	Age	April 3, 1920
Gilooly, William F.	L, 7th U. S. Inf.	Corporal	38	Ireland	61		Hernia	Mar. 21, 1918
Gingher, John T.	I, 9th Pa. Cav.	Private	14	Pennsylvania	71	38 00	Rheumatism	Sept. 28, 1911

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA, JUNE 30, 1919.

Name	Company and regiment	Rank	Length of service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Gleason, James	U. S. Navy	Landsman	9	Massachusetts	48	12 60	La grippe	Dec. 12, 1918
Graham, John N.	K. 7th Mo. Cav., etc.	Private	46	Wisconsin	70	40 00	Asthma	July 28, 1914
Gould, James L.	U. S. Navy	Actg. Eng.	36	Maine	69	40 00	Rheumatism	Jan. 15, 1912
Gowan, Thomas	F. 21st U. S. Inf.	Private	36	Connecticut	70		General debility	Nov. 13, 1916
Graham, Richard	U. S. Navy	Seaman	42	England	61	38 00	Asthma	Oct. 22, 1901
Graham, William	I. 18th Mass. Inf.	Private	17	Ireland	56	35 00	Valvular heart disease	Oct. 16, 1901
Green, Edward J.	E. 1st Cal. Vol. Inf.	Private	12	New York	48		Rheumatism	Oct. 23, 1914
Gron, John	C. 28th U. S. V. Inf.	Private	22	Ireland	38		Spinal trouble	July 29, 1919
Greenwald, Samuel	I. 1st U. S. V. Cav.	2d Lieut.	5	California	60	8 00	Rheumatism	May 9, 1920
Griffin, Stockton L.	A. 14th Ill. Inf.	Private	37	Ohio	78	40 00	Age	Oct. 5, 1918
Grimes, John L.	U. S. Navy	Blacksmith	70	California	43		Hernia	Jan. 3, 1912
Grogan, Thomas C.	Hosp. Corps, U. S. A.	Asst. Hosp. St.	12	Virginia	54		Rheumatism	Nov. 4, 1914
Gunn, William De La F.	E. 2d Minn. Cav.	Private	23	Indiana	76	38 00	Kidney trouble	April 3, 1920
Hafner, Andrew	U. S. Navy	Landsman	11	Germany	75	32 00	Paralysis	May 23, 1918
Hagaman, Abraham J.	I. 2d Vet. N. Y. Cav.	Private	25	New York	58	40 00	Rheumatism	April 27, 1903
Hagerty, John	K. 8th Pa. Cav.	Private	2	Ireland	83		Old age	May 16, 1913
Haggerty, Michael	G. 9th Mass. Inf.	Private	36	Ireland	72	40 00	Age	May 12, 1914
Haldikar, James	U. S. Navy	1st Cl. Fireman	29	Denmark	65	40 00	Broken ribs	May 25, 1903
Hall, Henry	E. 8th Pa. Inf.	Private	18	Vermont	71	38 00	General debility	Aug. 15, 1898
Hamilton, Frank G.	D. 6th U. S. Inf., etc.	Sergeant	156	New York	69		Rheumatism	April 1, 1920
Hamilton, John	U. S. Navy	Landsman	3	Ireland	68	30 00	Rheumatism	Sept. 27, 1912
Hamilton, Thomas F.	I. 73d Ohio Inf.	1st Lieut.	46	Ohio	67	40 00	General debility	Nov. 9, 1905
Hammond, Abram	I. 1st Tenn. Cav.	Major	15	Virginia	87	24 60	Rupture	Nov. 3, 1913
Hanley, Michael	A. 6th U. S. Inf.	Private	36	Ireland	43		Piles	Jan. 3, 1913
Hardy, James S.	H. 7th W. Va. Vet. Cav.	Private	17	Virginia	76	35 00	Varicose veins	July 20, 1909
Harkness, Oscar L.	K. 78th Ill. Inf.	Private	33	Illinois	65	40 00	Rheumatism	Dec. 17, 1909
Harney, Robert	A. 62d Mass. Inf.	Private	1	Massachusetts	62		Sore leg	July 4, 1913
Harris, George	M. 5th N. Y. H. Art.	Private	15	Ireland	71	35 00	Rheumatism	Oct. 9, 1912
Hart, Jesse B.	A. 66th Ohio Inf.	Private	20	Ohio	68	30 00	Partial paralysis right hand	June 16, 1914
Harvey, John R.	G. 14th U. S. Inf.	Private	15	Pennsylvania	33		Stomach trouble	April 11, 1906
Haskins, Charles	D. 8th N. Y. Cav.	Private	38	New York	69	40 00	Rheumatism	May 1, 1913
Hatherly, William	H. 1st U. S. Vol. Engrs.	Private	11	England	68	32 00	Rheumatism	Oct. 13, 1915
Haves, Elias M.	I. 32d U. S. Vol. Inf.	Private	20	Argentine Rep.	53		Skin disease	Feb. 7, 1914
Hawkins, William J.	E. 2d Ill. Cav.	Private	10	Illinois	73	32 00	Lame back	Mar. 23, 1910
Hayes, Frank P.	L. 1st U. S. V. Cav.	2d Lieut.	4	Canada	42		Dysentery; malaria	May 20, 1905
Hayes, Hugh	I. 7th Vermont Inf.	Private	4	Ireland	55	30 00	Asthma	Nov. 25, 1897
Heales, John	B. 6th Wis. Inf.	Private	42	England	79	40 00	Age	June 10, 1915

Herrie, Philip	K, 13th Ohio Cav., etc.	Private	66	France	67	39 50	Deafness	Nov. 13, 1911
Hickson, William	D, 13th Ill. Cav.	Private	20	Kentucky	68	38 00	Prostate glands	Oct. 27, 1914
Higgins, John	K, 175th Ohio Inf., etc.	Private	11	Ohio	64	32 00	Dropsy	Mar. 26, 1911
Hildebrand, James O.	D, 1st Pa. Cav.	Private	16	Pennsylvania	57	35 00	Rheumatism	Dec. 24, 1901
Hill, Edwin D.	C, 4th Ohio Cav.	Trumpeter	6	Ohio	51	39 00	Rheumatism	April 7, 1902
Hills, Henry H.	L, 2d Minn. Inf.	2d Lieut.	47	Illinois	69	40 00	Catarrh, stomach and throat.	Sept. 24, 1910
Hinden, Valentine	K, 14th U. S. Inf., etc.	Private	36	France	66	40 00	Rheumatism	Oct. 1, 1909
Hindecock, James W.	A, 42d Mo. Inf.	Private	13	New York	59	32 00	Age; deafness	Oct. 1, 1899
Hobart, Frank P.	U. S. Navy	Carpenter's Mate	38	Pennsylvania	50	40 00	Crippled left hand	Jan. 8, 1920
Hollenwager, Louis	K, 26th Ohio Inf.	Private	51	Germany	76	40 00	Piles	Sept. 10, 1911
Holmes, Charles A.	H, 9th U. S. Inf.	Private	41	New Brunswick	47	12 00	Sclerosis	Dec. 12, 1908
Holstrand, Nicholas	F, 15th Conn. Inf.	Private	9	Sweden	52	32 00	Partial paralysis	Dec. 14, 1888
Holt, David H.	F, 8th Cal. Inf.	2d Lieutenant	31	Maine	64	40 00	Chronic diarrhea	Oct. 21, 1904
Hood, Edward P.	F, 2d Cal. Inf.	Private	33	New Hampshire	56	40 00	Rupture	Sept. 19, 1896
Hoford, Henry H.	L, 2d U. S. V. Engrs.	1st Cl. Private	11	Indiana	63	---	Physical weakness	Nov. 21, 1917
Hough, George H.	H, 35th U. S. V. Inf.	Private	2	California	52	---	General debility	Mar. 15, 1916
Howard, John W.	D, 14th N. Y. H. Art.	Private	19	New York	76	35 00	Loss left arm	Dec. 30, 1919
Hubbard, James L.	D, 6th Mo. Vol. Inf., etc.	Private	46	Indiana	45	---	Gastritis; throat trouble	Sept. 11, 1917
Hubbard, John N.	19th Ind. Inf.	Private Mus.	38	Indiana	71	40 00	Rheumatism	July 15, 1911
Huber, Henry M.	C, 1st Cal. Vol. Inf.	Private	15	California	67	---	Rheumatism	June 18, 1920
Hughes, Charles	U. S. Navy	2d Cl. Machinist	22	England	48	---	Asthma	Aug. 10, 1914
Hughes, James	U. S. Navy	Seaman	37	England	64	40 00	Age	Jan. 11, 1905
Hughes, John W.	H, 1st S. D. Vol. Inf.	Private	15	California	53	---	Rheumatism	Nov. 14, 1917
Hughes, George W.	B, 4th Ohio Cav.	Private	33	Ohio	67	40 00	Rheumatism	Oct. 8, 1912
Hugoborn, Fred	A, 5th U. S. Cav.	Private	9	New York	60	---	Lame back	Oct. 27, 1916
Hunter, George E.	A, 4th U. S. Cav.	Sergeant	60	Nova Scotia	73	20 00	Rheumatism	Oct. 6, 1919
Hunter, William	B, 18th Pa. Inf.	Musician	15	Pennsylvania	72	40 00	Rheumatism	May 14, 1917
Huntton, George B.	K, 33d U. S. V. Inf.	Private	20	Virginia	51	---	Rheumatism; paralysis	April 11, 1917
Hynes, John A.	L, 17th Ill. Cav.	1st Lieut.-Adj.	18	Wisconsin	50	38 00	General debility	Oct. 19, 1893
Isham, Alfred W.	F, 13th Vt. Inf.	Private	12	Vermont	60	32 00	Loss 3 fingers and hand	Jan. 11, 1931
Jenkins, Roy E.	H, U. S. Signal Corps	Private	36	Maryland	45	---	Lumbago	May 12, 1915
Jennings, Thomas F.	B, 1st Bat. Cal. H. Art.	Private	8	Virginia	44	---	Heart trouble	Mar. 4, 1912
Jessup, Henry C.	D, 145th Pa. Inf.	Sergeant	33	Pennsylvania	70	40 00	General debility	April 5, 1909
Jewett, Loring A.	L, 32d Mass. Inf.	Private	34	Maine	58	40 00	Age	Mar. 16, 1901
Jockers, Charles	D, 1st Iowa Inf.	Private	6	Germany	59	30 00	Injury to leg	Nov. 38, 1893
Johnson, Frank	U. S. Navy	Landsman	6	New York	67	32 00	Injury to ribs	Oct. 4, 1914
Johnson, Richard	B, 23d Mo. Inf.	Private	32	Ohio	68	40 00	Varicose veins	Feb. 16, 1915
Johnston, William	L, 30th U. S. V. Inf.	Artificer	19	Michigan	38	---	Recent pneumonia	Aug. 7, 1918
Jones, George	G, 1st U. S. Inf., etc.	Sergeant	144	England	49	10 00	Mitochonditis	July 23, 1912
Jones, James T.	G, 1st Ill. Inf., etc.	Private	35	Illinois	70	40 00	Malaria	July 6, 1916
Jones, John P.	C, 73d Ill. Inf.	Private	35	Illinois	69	40 00	Heart trouble	July 13, 1914
Josselyn, Joseph H.	C, 2d Cal. Inf.	Corporal	17	Massachusetts	63	35 00	Rheumatism	Sept. 37, 1909

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length of service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Kaiting, James	K, 4th Cal. Inf.	Private	14	Ireland	60	35 00	Chronic bronchitis	Mar. 17, 1895
Kane, Bernard	K, 16th Ill. Inf.	Private	30	Ireland	75	40 00	Cataract; rheumatism	Aug. 7, 1903
Kane, Hugh	A, 5th Pa. Cav.	Private	15	Ireland	65	35 00	Lumbago	Feb. 14, 1904
Karr, William	B, 9th Mich. Cav.	Private	21	Pennsylvania	73	40 00	Age	May 8, 1911
Kaufman, Charles, alias Charles Merchant	M, 16th N. Y. Cav.	Private	7	Germany	72	32 00	Nervousness	July 8, 1913
Kearnes, Washington I.	K, 91st N. Y. Inf.	Private	10	New York	65	32 00	Incipient paralysis	June 7, 1911
Kearney, Matthew	H, 2d U. S. Cav.	Private	60	Ireland	67	20 00	Rheumatism	Nov. 8, 1918
Kearns, Thomas	I, 14th Maine Inf., etc.	Private	17	Maine	73	35 00	Age; neuralgia	Mar. 1, 1920
Kershner, Rufus	B, 16th Ohio Inf.	Private	10	Ohio	78	32 00	Age; rheumatism	Sept. 22, 1917
Keyser, Albert	I, 35th U. S. V. Inf., etc.	Private	76	Colorado	47	24 00	Fracture, right fibia	April 12, 1920
Kidder, John W.	D, 3d Wis. Inf.	Private	54	Wisconsin	72	40 00	Age	Dec. 18, 1915
Kiernan, John	E, 2d U. S. Cav.	Private	60	Connecticut	65	40 00	Hernia; rheumatism	Nov. 19, 1919
Kimbrough, Alexander	K, 4th Ky. Inf.	Sergeant	40	Kentucky	78	40 00	Age; defective vision	Mar. 27, 1917
Kingman, Albert E.	K, 27th N. Y. Inf., etc.	Private	43	New York	70	40 00	Age	May 1, 1913
Kinsley, Richard	H, 4th U. S. Inf.	Private	60	Massachusetts	61	20 00	Rheumatism	Dec. 9, 1918
Kitchen, Walter S.	G, 2d Mass. Art., etc.	Private	133	Massachusetts	72	40 00	Rheumatism	Aug. 25, 1907
Knadler, Abner C.	E, 20th Ill. Inf.	Private	38	Ohio	81	40 00	Rheumatism	Oct. 6, 1919
Knapp, Orris	A, 3d Colo. Cav.	Sergeant	4	Massachusetts	84	30 00	Age	Nov. 15, 1916
Knickmeyer, William	I, 1st Mo. Art.	Private	30	Germany	64	40 00	Heart disease	May 25, 1904
Knight, Robert	H, 10th R. I. Inf.	Private	3	Rhode Island	72	30 00	Deafness	Sept. 25, 1917
Knott, Thomas	K, 2d Mo. Cav.	Private	36	Ohio	62	40 00	Rheumatism	Sept. 25, 1904
Kroning, Ernest	U. S. Navy	Seaman	6	Germany	49	35 00	Stomach trouble	Nov. 3, 1910
Kilsel, Gustave	M, 3d N. Y. Cav., etc.	Private	55	Germany	75	35 00	Loss left leg	April 16, 1919
Lamb, Henry S.	C, 42d Wis. Inf.	Corporal	10	Ohio	71	32 00	Smelly; bronchitis	June 19, 1914
Lambert, Leander E.	C, 1st Idaho Vol. Inf.	Private	14	Indiana	57	32 00	Stomach trouble	Oct. 23, 1915
Lane, William	U. S. Navy	Ord. Seaman	12	England	76	35 00	Age	April 12, 1917
Lang, Joseph	E, 8th Cal. Inf.	Private	7	Indiana	51	32 00	Injury to hip	Mar. 19, 1914
Larish, Henry	E, 21st Ill. Inf.	Private	10	Pennsylvania	54	32 00	Rheumatism	Oct. 7, 1884
Lawrence, Demarquis L.	K, 22d Maine Inf.	Private	11	Maine	82	32 00	Age	July 19, 1918
Lee, William	M, 25th U. S. Inf., etc.	Corporal	36	Kentucky	48	34	Aphasia; hemiplegia	Sept. 27, 1914
Leonard, Enoch	M, 6th Ill. Vol. Inf.	Private	5	Illinois	34	34	Fracture right leg	Sept. 11, 1912
Lewis, Edwin F.	E, 4th Ky. Vol. Inf., etc.	Sergeant	32	Kentucky	48	34	Pulmonary trouble	Sept. 22, 1919
Lewis, George W.	I, 39th Mo. Inf.	2d Lieutenant	6	Missouri	75	35 00	Paralysis	Feb. 26, 1919
Lewis, Nelson	U. S. Navy	Landman	25	Ohio	71	35 00	General debility	Dec. 16, 1910
Lewis, William	B, 31st Maine Inf., etc.	Corporal	15	Maine	69	40 00	Age; failing vision	Mar. 11, 1914

K, 14th Minn. Vol. Inf., etc. U. S. Navy	Corporal 1st Class Boat- swain's Mate	63	Norway	44	24 00	Heart disease.	Dec. 31, 1910
Lillivig, Andrew	Private	251	Maine	67	36 18	Partial blindness.	June 21, 1920
Londerman, John	Private	19	New York	60	38 00	Defective vision.	July 21, 1904
Long, John	Private	27	Ohio	79	38 00	Lung trouble.	Sept. 24, 1916
Loos, Thomas F.	Musician	20	Massachusetts	55	38 00	Rheumatism	May 17, 1894
Lord, Jacob S.	Private	29	Iowa	58	40 00	Rupture	Mar. 31, 1896
Lorr, Anthony	Private	60	New York	61	25 00	Rheumatism	May 9, 1913
Lynch, Edward	Private	31	New York	53	54	Bronchitis	Sept. 27, 1910
Lynch, John	P. M.'s Yeoman	36	New York	50	54	Partial paralysis	Jan. 8, 1914
Lyons, John M. J.	Private	15	Pennsylvania	40	54	Rheumatism	April 1, 1910
Lyons, John W.	Private	48	Ireland	55	54	Heart trouble	Jan. 12, 1920
McAlister, Hugh	Landisman	13	New York	72	24 00	Rupture	April 19, 1915
McCabe, Francis	Private	8	New York	72	32 00	Age	June 26, 1915
McCabe, Hugh F.	2d Cl. Fireman	36	Ireland	56	32 00	Rheumatism	July 16, 1898
McCabe, James	Private	144	Ireland	58	2 50	Asthma	Mar. 6, 1913
McCafterty, Francis	Ord. Seaman	35	Pennsylvania	72	40 00	Rheumatism	Jan. 6, 1920
McCart, John	Sergeant	36	New York	63	40 00	Asthma	July 31, 1905
McCarthy, Daniel	Private	4	Iowa	76	30 00	Age	Sept. 14, 1912
McClintic, Michael S.	Private	34	Ohio	69	40 00	Hernia	Sept. 28, 1912
McClish, Stewart	Private	5	Illinois	65	30 00	Rheumatism	Nov. 22, 1911
McCollum, William	Sergeant	37	Indiana	45	54	Throat trouble	Jan. 20, 1914
McCrory, George S.	Private	6	Pennsylvania	53	54	Kidney trouble	Sept. 29, 1914
McDade, James D.	Corporal	12	New York	60	54	Myocarditis	May 23, 1913
McDermott, William J.	Private	25	New York	78	40 00	Chronic diarrhea	Feb. 7, 1906
McDonald, Frank	Fife Major	25	Washington, D. C.	76	40 00	Loss thumb and finger rt. hd.	Dec. 31, 1919
McFarland, William	Private	60	New York	41	60	Stomach trouble	Sept. 29, 1912
McGrath, Thomas F.	Private	36	Ireland	67	23 00	Deafness	Mar. 10, 1905
McGuire, John	Private	5	Illinois	54	54	Neuralgia	July 20, 1903
McGuire, Charles	Private	25	Missouri	78	40 00	Age; rheumatism	Mar. 11, 1919
McKinney, Greenup A.	1st Lieutenant	38	Pennsylvania	50	40 00	Rheumatism	April 24, 1903
McMahon, Lawrence C.	Private	23	Canada	64	38 00	Nervous debility	April 24, 1903
McNames, Calvin	Hosp. Steward	36	Ireland	66	50	Rheumatism	Feb. 24, 1915
McNeill, Daniel	1st Cl. Fireman	238	Ireland	61	19 38	Dislocation right shoulder	Jan. 26, 1910
McNeirney, John J.	Private	22	Scotland	70	38 00	Fracture right wrist	Dec. 23, 1904
McOmie, Henry	Private	24	Indiana	61	40 00	General debility	Oct. 5, 1909
McPherson, August W.	Sergeant	36	England	75	32 00	Blood pressure	June 22, 1920
McQuade, Michael	Private	3	Ohio	73	30 00	Age	Jan. 8, 1914
McWilliams, John O.	Private	17	Maryland	45	45	Rheumatism	Nov. 19, 1914
MacPherson, John H.	U. S. Marine Corps	22	England	65	35 00	Partial paralysis	Nov. 20, 1907
Magee, John	Private	24	Ireland	46	30 00	Disease of rectum	Aug. 6, 1892
Maguire, Thomas	Private	24	Massachusetts	50	38 00	Lumbago	Dec. 5, 1896
Mahan, Joseph	Landisman	35	Ireland	55	38 00	Broken leg	April 29, 1903

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Mahoney, James	A, 2d Maine Cav.	Private	9	Canada	68	32 00	Effects of pneumonia	Oct. 7, 1911
Mailey, William	G, 8th Cal. Inf.	Private	11	Ireland	68	32 00	Deafness	Mar. 17, 1907
Maloney, Michael	K, 193d N. Y. Inf.	Private	9	Canada	68	32 00	Rheumatism	Feb. 1, 1916
Marquis, Ellison	F, 133d Ind. Inf.	Private	10	Indiana	61	32 00	Rheumatism	June 6, 1909
Marrett, William	U. S. Navy	Fireman	70	England	70		Nervous trouble	June 14, 1920
Marsh, Randolph C.	F, 32d Ohio Inf., etc.	Sergeant	37	Ohio	58	46 00	Hernia	Dec. 4, 1896
Marshall, Robert	G, 24th U. S. Cav.	Private	40	Maryland	57	40 00	Deafness	June 2, 1899
Martin, Cassius C.	G, 68th Ill. Inf.	Private	6	Illinois	74	30 00	Paralysis	Mar. 30, 1913
Martin, Henry	U. S. Navy	Landsman	9	England	64	32 00	Heart disease	Feb. 15, 1906
Mason, Charles M.	H, 33rd Maine Inf.	Private	20	Maine	59	38 00	Stomach and liver trouble	Oct. 10, 1903
Mathews, Robert F.	U. S. Navy	Landsman	139	Maryland	51		Rheumatism	Feb. 11, 1919
Mathieson, Hans C.	K, 4th U. S. Cav.	Private	15	California	31	17 00	Gunshot wound left leg	April 5, 1919
Maurice, James	U. S. Navy	Seman	37	Wals	53	40 00	Injury from burns	July 30, 1891
Maxwell, Isaac	B, 9th U. S. Cav., etc.	Private	79	Georgia	43		Stomach trouble	Nov. 21, 1919
Mayfield, Wesley H.	G, 7th Ill. Inf.	Private	5	Missouri	76	30 00	Age	Nov. 17, 1919
McLean, Thomas	H, 6th Pa. Cav.	Private	36	Ireland	69	40 00	Scallity	Dec. 31, 1902
Meincke, George	B, 13th Minn. Vol. Inf.	Private	9	Germany	60		General debility	Jan. 25, 1918
Melody, Hugh J.	U. S. Navy	Coal Passer	118	California	41		Rheumatism	Nov. 1, 1909
Melton, Jerome S.	A, 14th Mo. Cav.	Private	7	Iowa	66	30 00	Rheumatism, sciatica	Dec. 17, 1914
Merced, John	L, 1st Cal. Cav.	Private	28	Virginia	72	40 00	Chronic bronchitis	April 28, 1914
Merriman, Elijah R.	F, 5th W. Va. Inf.	Captain	37	Pennsylvania	83	40 00	Age	Aug. 5, 1919
Metcalf, Samuel W.	M, 2d Wis. Cav.	Corporal	44	Ohio	74	40 00	Age	Feb. 1, 1917
Metzger, Alfred	I, 153d Ind. Inf.	Private	6	Indiana	68	39 00	Age	April 6, 1915
Meyer, Bruno	C, 8th Cal. Inf.	Private	14	Germany	56		Rheumatism	May 5, 1914
Meyer, Eugene	A, 1st Cal. H. Art.	Sergeant	14	Sweden	49		Paralysis	June 9, 1920
Meyer, Gustave	E, 1st Neb. Vol. Inf.	Private	14	Wisconsin	48	6 00	Gunshot wound right knee	Mar. 30, 1913
Meyer, John	E, 1st U. S. Cav.	Sergeant	60	Germany	60		Rheumatism	Nov. 28, 1913
Mikulich, George	I, 16th U. S. Inf.	Private	26	Denmark	87	8 00	Broken left leg	Oct. 4, 1911
Mikulich, Jacob C.	U. S. Navy	Ord. Seaman	14	Austria	66	35 00	Rheumatism	Oct. 3, 1909
Miller, Albert	K, 3rd U. S. V. Inf.	Private	37	New York	55		Hemorrhoids	Nov. 18, 1919
Miller, Charles, No. 4	G, 25th Ill. Inf.	Private	16	Switzerland	73	40 00	Defective vision	Jan. 8, 1915
Miller, Jacob, No. 1	M, 6th Ohio Cav.	Private	20	Ohio	64	40 00	Rupture	July 7, 1905
Miller, Jacob, No. 2	L, 6th U. S. Cav.	Private	61	Ohio	61		Defective vision	Feb. 8, 1919
Miller, John, No. 4	M, 1st Cal. Cav.	1st Sergeant	36	Canada	58	40 00	Fracture left hip	July 19, 1902
Miller, John, No. 5	B, 1st Wash. Terr. Inf.	Private	36	Wisconsin	71	40 00	Throat trouble	April 21, 1916
Miller, John, No. 6	C, 3d U. S. Cav.	Private	66	Germany	71	30 00	Age	Nov. 26, 1919
Mills, Andrew B. V.	E, 29d N. Y. Inf.	Private	24	Pennsylvania	48	40 00	General debility	Aug. 1, 1891

Mitchell, Harrison	F, 14th Ill. Cav.	41	Illinois	74	40 00	Bladder trouble	Feb. 4, 1920
Moir, George	B, Utah L. H. Art.	14	Scotland	64	12 07	Dysentery	Dec. 6, 1919
Monahan, William	Private	6	Ireland	70	30 00	Blind	Oct. 27, 1908
Montgomery, William J.	Private	36	Connecticut	56	40 00	Rheumatism	Jan. 16, 1901
Moody, William H.	Private	45	Massachusetts	76	40 00	General debility	Dec. 16, 1919
Mooney, Francis	Private	28	Ireland	73	20 00	Age	Sept. 1, 1915
Moore, Egbert	Private	87	Alabama	39	8 00	Malarial poisoning	Nov. 24, 1919
Moore, John W.	H, 20th U. S. Inf., etc.	38	Germany	59	32 00	Prostratis	Aug. 19, 1911
Morgan, John S.	Private	36	Illinois	65	38 00	Rheumatism	July 22, 1920
Morris, Charles T.	14th Bat. Field Art.	11	Pennsylvania	59	38 00	Rheumatism	Mar. 22, 1920
Morris, Francis	Private	21	Canada	65	38 00	Rheumatism	Sept. 14, 1905
Morris, John	A, 89th N. Y. Inf.	37	Russia	63	30 00	Rheumatism	Dec. 8, 1903
Morrison, David J.	D, 6th Ind. Cav.	37	India	79	40 00	Age	May 24, 1920
Morton, Charles H.	F, 6th Cal. Vol. Inf.	59	Connecticut	59	40 00	Lumbago	Aug. 9, 1916
Mott, William E.	F, 14th Conn. Inf.	25	New York	57	40 00	General debility	Dec. 11, 1898
Muller, Frederick	Hosp. Corps, U. S. A.	120	New Jersey	50	8 00	Scleritis, etc.	Aug. 27, 1908
Muller, Fritz A.	U. S. Navy	19	Germany	48	8 00	Rheumatism	Mar. 11, 1910
Munroe, Kirk	G, 2d U. S. H. A.	7	Massachusetts	52	43	Defective vision; broken hand.	Mar. 11, 1919
Murbach, Albert	19th U. S. Signal Corps	17	Wyoming	43	40 00	Heart and kidney disease.	April 3, 1917
Murphy, Daniel	U. S. Navy	36	Ireland	77	40 00	Age	Dec. 8, 1919
Murphy, John	F, 3d U. S. Inf., etc.	91	Ireland	27	37	Loss left arm.	July 27, 1917
Murphy, Patrick	B, 2d U. S. Art.	53	Ireland	67	40 00	Rupture	May 20, 1913
Murray, George W.	K, 1st N. Y. Mid. Rifles	38	Long Island	75	40 00	Stomach trouble	July 14, 1917
Murray, Michael	2d Lieutenant	19	Ireland	45	7 50	Rheumatism	Sept. 14, 1911
Murray, Thomas R., alias	3d Lieutenant	60	Ireland	69	7 50	Rheumatism	Sept. 26, 1900
Myers, E. Morphy	D, 5th Mo. Vol. Inf.	6	Iowa	50	7 50	Rheumatism	Nov. 5, 1919
Myers, Wilson A.	Private	6	Iowa	50	7 50	Rheumatism	Nov. 5, 1919
Ness, Andrew	H, 4th Minn. Inf.	17	Sweden	63	30 00	Heart trouble	Mar. 24, 1897
Newby, William	G, 23d Ohio Inf.	7	Indiana	67	32 00	Heart trouble	May 1, 1913
Noble, Arthur	B, 4th U. S. Cav.	28	Ireland	45	45	Rheumatism	Aug. 23, 1919
Norman, Newton	L, 16th Mo. Cav.	10	Missouri	72	32 00	Dysentery	Jan. 25, 1916
Norrmann, Wilhelm H.	A, 8th U. S. Inf.	69	Prussia	71	40 00	Age	May 24, 1916
O'Bannon, William	C, 62d Ill. Inf.	39	Kentucky	82	40 00	Apoplexy	April 7, 1920
O'Brien, John	U. S. Navy	46	Ireland	55	40 00	Heart disease	April 15, 1897
O'Brien, John S.	A, 1st Cal. Vol. H. Art.	16	Ireland	48	48	Kidney trouble	Dec. 29, 1902
O'Brien, Talbert S.	F, 3d Kans. Militia	3	Missouri	65	48	Rheumatism	April 5, 1911
O'Donnell, Patrick	E, 9th Md. Inf.	10	Ireland	73	32 00	Old age	Sept. 12, 1815
O'Neill, Timothy	U. S. Navy	3	Massachusetts	65	30 00	Rupture	July 31, 1912
Osborn, Ambrose A.	U. S. Navy	15	Connecticut	72	35 00	Age	Dec. 12, 1916
Osborn, Henry H.	27th Indpt. N. Y. Lt. Art.	19	Canada	71	38 00	Rheumatism	Oct. 1, 1913
Osterberg, John F.	U. S. Navy	39	Sweden	69	20 00	Age	Dec. 13, 1915
Owens, John W.	H, 113th Ind. Inf.	6	Indiana	70	20 00	Gunshot wound left thigh	Aug. 27, 1913

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Palmer, Hugh	U. S. Navy	Orl. Seaman	35	Prince Edward's Island	46	30 00	Loss right leg	April 7, 1895
Parre, Daniel	H, 80th N. Y. Inf.	Private	35	Canada	77	35 00	Age	April 22, 1920
Pascoe, William O.	I, 1st Cal. Cav.	Corporal	32	England	79	40 00	General debility	July 17, 1917
Paul, Frederick	C, 3d U. S. Cav.	Private	60	Germany	67	20 00	Rheumatism	Sept. 5, 1918
Peddy, Thomas	B, 133th U. S. C. Inf.	Private	8	Georgia	75	32 00	Age	April 26, 1920
Pedersen, Jacob	U. S. Navy	Landsman	248	Norway	43	20 36	Rheumatism	Nov. 7, 1907
Penderbith, Richard H.	K, 17th Wis. Inf.	Private	68	Wisconsin	68	32 00	Rheumatism	Sept. 23, 1918
Pendergast, Enos	U. S. Navy	Seaman	14	Ireland	62	35 00	Rheumatism	June 29, 1912
Perkins, Elbert G.	D, 61st Mass. Inf.	Private	10	Maine	60	32 00	La grippe	April 14, 1906
Perry, William A.	E, 5th N. Y. Cav.	Sergeant	14	New York	68	35 00	Injury right leg	June 19, 1915
Petty, George F., alias George F. Lukins	F, 73d Ohio Inf.	Private	15	Ohio	74	35 00	Gunshot wound left leg	Jan. 21, 1920
Pettyjohn, Moses	B, 34th Ohio Inf.	Private	26	Ohio	75	40 00	Loss left leg	June 28, 1915
Phalen, Henry	B, 9th N. Y. S. M. Inf.	Private	2	New York	72		Rheumatism	Feb. 9, 1917
Phelan, John	U. S. Navy	Coal Passer	14	Ireland	65	35 00	Sclatica	Mar. 21, 1909
Phelp, George M.	A, 9th Mich. Inf.	Private	26	Michigan	75	38 00	Rheumatism	June 7, 1920
Phillips, William	H, 8th Iowa Inf.	Private	36	Pennsylvania	73	40 00	Gunshot wound	Jan. 21, 1916
Pidge, William C.	1st Bat. Wis. Lt. Art.	Private	36	New York	75	40 00	Age	Mar. 14, 1918
Pierpoint, Frank	U. S. Marine Corps	1st Sergeant	60	England	49	40 00	Loss left foot	Sept. 10, 1913
Pierpont, John B.	K, 10th Conn. Inf.	Private	37	Canada	59	40 00	Partial paralysis	July 6, 1904
Pifer, Adam	D, 14th Cal. Cav.	Private	18	Pennsylvania	70	38 00	General debility	Oct. 4, 1916
Pile, George A.	B, 6th Cal. Vol. Inf., etc.	Private	41	California	46		Injury to back	June 22, 1920
Pilger, John	E, 9th Ohio Cav.	Private	36	Germany	58	40 00	Varicose veins	Oct. 24, 1902
Pipey, Edward W.	B, 36th Mass. Inf.	Private	34	Prince Edward's Island	57	40 00	Rheumatism	May 16, 1883
Plumb, Edwin W.	M, 2d U. S. Art.	Private	36	Connecticut	71	30 00	Kidney trouble	Oct. 14, 1919
Porter, Thornton G.	B, 2d Cal. Cav.	Private	37	Missouri	78	40 00	Eczema	July 15, 1913
Price, James H.	U. S. Navy	Nurse	21	Pennsylvania	53	40 00	General debility	May 18, 1898
Priest, Charles E.	C, 11th Kansas Cav.	Private	17	New Hampshire	52	35 00	Rheumatism	Jan. 9, 1897
Pryor, Jeremiah	C, 2d Cal. Inf.	Private	12	Missouri	69	32 00	Rheumatism	Jan. 25, 1912
Putnam, Charles C.	B, 3d U. S. Art., etc.	Private	36	Massachusetts	62	35 00	Rupture	Jan. 17, 1911
Qualters, Michael	L, 4th Mass. Cav.	Sergeant	49	Ireland	54	40 00	General debility	Jan. 6, 1894
Ralph, Thomas	I, 7th U. S. Inf.	Private	60	Ireland	68	20 00	Stomach trouble	Dec. 8, 1919
Randall, Warren G.	D, 1st Maine Cav.	Private	19	Maine	58	30 00	Rheumatism	Sept. 30, 1904

Ransom, Fayette	H, 2d N. Y. H. Art.	7	New York	64	40 00	Lumbago	Mar. 25, 1909
Ray, Major	G, 4th Cal. Inf.	47	New Scotia	74	32 00	Sociate rheumatism	July 18, 1913
Raymond, George W.	B, 7th Minn. Inf.	48	New York	72	30 00	Rheumatism	Oct. 16, 1911
Rea, William B.	B, 1st Idaho Vol. Inf.	15	Michigan	59			May 11, 1917
Reardon, John	U. S. Navy	27	Missouri	52	38 00	Rheumatism	Nov. 28, 1895
Regan, Thomas	A, 1st Bat. Nev. Vol. Inf.	3	Illinois	55		Nephritis	June 17, 1913
Rein, Sebastian	I, 196th Ohio Inf.	6	Austria	80		Rheumatism	Dec. 30, 1913
Remkin, Joseph	F, 1st Ill. Lt. Art.	7	Vermont	85	40 00	Partial blindness	Nov. 8, 1909
Renkin, Carsten J.	C, 1st Cal. Vol. H. Art.	41	Germany	71	40 00	Rheumatism	Jan. 10, 1913
Rheinhardt, Jared C.	K, 34th Pa. Inf., etc.	49	Pennsylvania	71	40 00	General debility	Mar. 16, 1911
Rhodes, John	E, 9th Iowa Cav.	28	England	75	40 00	Age; Rheumatism	Nov. 5, 1911
Rhoda, William C.	B, 144th Ill. Inf.	11	Illinois	75	32 00	Rheumatism	July 23, 1918
Richardson, Theodore W.	K, 15th Ind. Inf.	9	Indiana	70	40 00	Rheumatism	Sept. 22, 1912
Ricketts, Sylvester H.	H, 10th Mo. Inf.	38	Ohio	72	32 00	Age	Dec. 27, 1916
Riley, Elias F.	C, 2d Va. Inf.	4	Virginia	76	38 00	Rheumatism	April 26, 1916
Risk, Robert	C, 24th Mass. Inf.	20	Massachusetts	50	40 00	General debility	Mar. 20, 1894
Ritchie, William H.	U. S. Navy	41	New York	61	35 00	Lumbago	Jan. 11, 1909
Robbin, Frederick	E, 20th N. Y. Inf.	13	Germany	74	40 00	Age	Dec. 12, 1916
Roberts, Harry E.	F, 1st Wash. Vol. Inf., etc.	54	Iowa	45		Broken shoulder	Oct. 2, 1915
Robinson, Joseph F.	B, 1st Cal. Vol. Inf., etc.	17	Kentucky	50	14 00	Ulcer of rectum	Nov. 16, 1911
Rochford, Henry	H, 12th U. S. Inf.	36	Ireland	70		Lumbago	Nov. 23, 1913
Rogers, George F.	H, 15th Ill. Cav., etc.	10	Illinois	69	32 00	Double rupture	Dec. 15, 1914
Rogers, John A.	C, 1st Cal. Vol. Inf.	13	Ohio	54		Locomotor ataxia	Nov. 8, 1914
Rogers, William	F, 2d Cal. Inf.	18	Massachusetts	66	32 00	Chronic gonitis	Nov. 9, 1915
Roper, Meah J.	F, 2d U. S. Vol. Inf.	10	So. Carolina	43		Rheumatism	Aug. 23, 1922
Roque, Emanuel	F, 12th U. S. Inf.	60	Azores	65	20 00	Rheumatism	June 17, 1926
Rosen, James	G, 2d U. S. Vol. Inf.	12	Russia	49	10 00	Rheumatism	Dec. 19, 1912
Ross, Charles M.	B, 10th Ind. Cav., etc.	21	Indiana	45	30 00	Injury right knee	April 12, 1892
Rowan, John	D, 2d Tenn. Cav.	34	Tennessee	75	40 00	Gunshot wound left leg	Aug. 13, 1917
Rowland, George E.	B, Bat. Utah Lt. Art.	14	Missouri	64		Rupture; lame back	June 6, 1919
Sage, Henry P.	U. S. Navy	36	Connecticut	64	40 00	General debility	Aug. 1, 1913
Sage, Philo G.	I, 4th Iowa Cav.	45	New York	82	40 00	Age	July 16, 1918
Sanders, Cyrus	H, 145th Ohio Inf.	4	Ohio	61	30 00	Dysentery	June 24, 1916
Sanders, William	K, 6th N. Y. Inf.	25	New York	53	40 00	Heart disease	June 15, 1891
Sandlin, William M.	I, 8th Ky. Inf., etc.	35	Kentucky	69	40 00	Stomach trouble	Sept. 17, 1913
Saunders, James M.	C, 7th U. S. Cav.	60	Pennsylvania	59	20 00	Blind right eye	Feb. 25, 1909
Saunders, Julius P., formerly Julius Erb.	H, 17th U. S. Inf., etc.	215	Germany	65	20 00	Rheumatism	June 7, 1920
Sawyer, Lewellyn	A, 17th Mass. Inf.	5	Maine	67		General debility	April 7, 1910
Sayer, John E.	H, 15th U. S. Inf., etc.	98	New York	58	12 00	Rheumatism	Mar. 25, 1914
Scheidt, John	K, 29th U. S. V. Inf., etc.	34	Illinois	59		Rheumatism	April 11, 1917
Schenck, James P.	U. S. Navy	108	Illinois	63		Rheumatism	April 9, 1919
Schlaburg, Charles	114th Coast Artillery	36	Ohio	42		Rheumatism; paralysis	June 22, 1920

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Continued.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when ad- mitted	Pen- sion per ad- month	Disability	When admitted
Schmidt, John C., alias John Smith	G, 2d Cal. Inf.	Private	36	Germany	76	40 00	Rheumatism	July 26, 1914
Schneider, Jacob	I, 3d N. Y. Inf.	Private	7	Germany	72	32 00	Broken wrist	Feb. 8, 1919
Schoupe, Carl	I, 1st Cal. Vol. Inf.	Private	17	Germany	51		Rheumatism	May 13, 1905
Schroeder, Paul	E, 6th Cal. Vol. Inf.	Corporal	7	Germany	52		Acute gastritis	Jan. 28, 1916
Schultz, Frederick W.	C, 1st Cal. Vol. Inf.	Private	13	Iowa	69		Dysentery	Nov. 5, 1912
Seaford, William A.	A, 1st Neb. Cav.	Private	28	Ohio	66	40 00	Rheumatism	Dec. 3, 1908
Scott, Charles, No. 3	B, 13th U. S. Inf., etc.	Sergeant	298	New York	68		Rheumatism	May 14, 1919
Seacher, Sanford	K, 135th Inf.	Private	5	Indiana	69	30 00	Blind	June 21, 1915
Seares, James H.	F, 1st Mass Cav.	Private	17	New Hampshire	70	38 00	Age	Feb. 25, 1912
Sebesta, Joseph	I, 22d U. S. Inf.	Private	26	Ohio	41		Tuberculosis	June 9, 1920
Sevenson, Ulrich	I, 35th Mass. Inf.	Private	14	Switzerland	65	35 00	Rheumatism	July 6, 1908
Sevenouke, John Edward	E, 31st Mo. Inf.	Private	3	Michigan	68		Dislocated right hip	Nov. 7, 1915
Sexton, James	A, 1st Nev. Vol. Inf.	Private	3	Ireland	50		Rheumatism	May 4, 1910
Seymour, Harry C.	37th U. S. Vol. Inf.	Com'sy Sgt.	18	Canada	62		Rheumatism	Nov. 19, 1917
Shade, George W.	B, 4th U. S. Art.	Private	96	Ohio	69	30 00	Broken hip joint	Dec. 19, 1918
Shaffer, Albert	C, 1st Mich. Cav.	Private	19	Ohio	62	35 00	Liver and heart trouble	Mar. 25, 1909
Shaffer, William F.	U. S. Navy	Landsman	50	Pennsylvania	36		Chronic rheumatism	Sept. 9, 1910
Shaw, Oliver M.	K, 39th Ill. Inf.	Private	11	Illinois	65	35 00	Lame ankle	Jan. 3, 1911
Shea, John	U. S. Navy	Landsman	26	Ireland	53	40 00	Rheumatism	Sept. 29, 1891
Sheehan, Daniel	U. S. Navy	Landsman	24	Ireland	51	40 00	Stricture	July 18, 1884
Sheridan, John	B, 2d N. Y. Prov. Cav.	Private	7	Ireland	68	32 00	Rheumatism	Jan. 5, 1912
Sheridan, Owen	A, 56th N. Y. Inf.	Private	16	Ireland	81	35 00	Partial loss use of limbs	April 22, 1919
Sherwood, Edmund	Band, 7th U. S. Inf.	Corporal	33	Pennsylvania	53		Hernia	Mar. 6, 1911
Shofer, John H., Jr.	G, 2d Cal. Cav.	Private	14	Indiana	65	35 00	Paralysis	Mar. 26, 1914
Short, Charles J.	M, 11th U. S. Cav.	Saddler	16	New York	46		Fractured ribs	Dec. 29, 1913
Shottenkirk, Chauncey F.	I, 21st Ill. Inf.	Corporal	24	New York	49	40 00	Age	Nov. 19, 1913
Skeds, Spencer L.	A, 150th Ohio Inf.	Private	17	New York	65	35 00	Rheumatism	Jan. 5, 1910
Skede, Frank M.	C, 12th Ohio Inf.	1st Lieutenant	39	Ohio	65	40 00	Hemorrhoids	Sept. 15, 1904
Shade, John W.	A, 1st Cal. Vol. Inf.	Private	14	Indiana	48	40 00	Loss right leg	Jan. 30, 1912
Smith, DeWitt C. R.	F, 11th Ill. Inf., etc.	Musican	46	Indiana	68	30 00	Age	Dec. 11, 1916
Smith, Edward, No. 3	E, 1st N. Y. Engineers	Private	37	Ireland	69		Rheumatism	Dec. 20, 1909
Smith, Francis M.	B, 22d Ohio Inf.	Private	33	Ohio	71	40 00	Lumbago	May 26, 1916
Smith, James A., alias Sylvester Mayo	U. S. Navy	Seaman	37	Nova Scotia	63	40 00	Crippled arm	April 15, 1916
Smith, Thomas J.	U. S. Navy	Boiler maker	36	Nevada	50		Pulmonary trouble	Oct. 21, 1916
Smith, William T.	36th Const Art.	Private	34	N. Carolina	57		Malaria	Jan. 22, 1919
Snyder, Martin	A, 19th Pa. Inf.	Private	33	Germany	64	30 00	Lame hip	Dec. 17, 1909
Snyder, Marshall	A, 9th N. J. Inf.	Private	3	New Jersey	63	30 00	Rheumatism	Sept. 23, 1909

Sopha, Frank M.	Hosp. Corps, U. S. A.	Private	17	Poland	52	Blind	Asthma	Aug. 30, 1913
Spankie, Gilbert W.	F, 1st Idaho Vol. Inf.	Private	11	Ireland	55	6 00	Blind	Feb. 19, 1907
Spahrak, Edward P.	F, 4th Md. Inf.	Private	32	Maryland	56	40 00	General debility	Aug. 16, 1894
Spaulding, John T.	K, 1st Cal. Vol. Inf.	Private	15	Wisconsin	67		Injury right knee	Dec. 5, 1911
Sprick, Henry	E, 1st U. S. Cav.	Private	60	Germany	62	30 00	Frozen toes, both feet	Dec. 5, 1911
Sprurgeon, Felix	F, 2d Ohio H. A.	Private	24	Ohio	53	40 00	Rheumatism	Dec. 21, 1899
Staub, Samuel	F, 7th Ind. Cav.	Private	31	Ohio	66	40 00	Rheumatism	Dec. 3, 1911
Stabler, John	A, Bat. O. N. G. Cav.	Private	2	Germany	82		Defective vision	June 18, 1911
Steele, Henry O.	D, 7th Iowa Inf.	Private	17	Iowa	70	30 00	Bronchitis	June 7, 1911
Stephenson, Ira B.	C, 20th U. S. Inf.	Private	25	Indiana	43		Rheumatism	July 15, 1903
Stewart, John T.	I, 49th Mo. Inf.	Private	11	Kentucky	68	30 00	Rheumatism	Jan. 14, 1908
Stewart, Joseph	C, 7th Iowa Cav.	Private	55	Ohio	67	40 00	Heart trouble	Mar. 9, 1913
Stolle, William	3d Bat. N. J. Lt. Art.	Private	16	Prussia	52	35 00	Kidney disease	Sept. 24, 1892
Storts, Andrew J.	H, 148th Ohio Inf.	Private	4	Ohio	72	40 00	General debility	June 11, 1918
Storell, William H.	B, 28th Maine Inf.	Private	12	Maine	58	35 00	Rheumatism	Dec. 18, 1895
Suggett, George H.	B, 49th Mo. Inf.	Private	12	Missouri	69	30 00	Neuralgia	June 27, 1917
Sullivan, Adrian A.	Band, 14th U. S. Inf.	Musician	73	Michigan	41		Rheumatism	Feb. 2, 1911
Sullivan, Florence H.	C, 15th U. S. Inf.	Sergeant	36	Vermont	68	21 00	Asthma	Jan. 8, 1920
Sullivan, Jeremiah J.	C, 121st N. Y. Inf.	Private	3	Ireland	68	30 00	Rheumatism: blind one eye	Nov. 23, 1916
Sullivan, John, No. 5.	U. S. Navy	Coal Heaver	36	Ireland	82	40 00	Kidney trouble	July 6, 1914
Sullivan, John F., No. 2.	U. S. Navy	Fireman	38	California	39	8 00	Rheumatism	Mar. 20, 1903
Sullivan, Michael	D, 2d Conn. Inf.	Private	12	Ireland	53	35 00	Rupture	Sept. 6, 1894
Sutherland, DeMotte W.	A, 8th Ill. Inf.	Private	13	Illinois	63	35 00	Lead poisoning	May 24, 1911
Sweeney, John, No. 3.	G, 4th Mass. Inf.	Corporal	22	Ireland	78	38 00	Age	April 12, 1920
Talbot, John	L, U. S. Engineers	Private	11	England	60		Sciatic rheumatism	Nov. 2, 1912
Tanner, Elijah	F, 174th Ohio Inf.	Private	11	Ohio	64	32 00	Rheumatism	Jan. 1, 1911
Tansy, Edward J.	A, 122d Ill. Inf.	Private	5	Illinois	71	32 00	Age	July 13, 1916
Tateburg, Ernest W.	I, 39th Ill. Inf.	Sergeant	59	Germany	79	40 00	Age	Nov. 17, 1911
Taylor, James O.	K, 32d Mass. Inf.	Private	6	Massachusetts	76	32 00	Gunshot wound left knee	June 17, 1913
Taylor, Samuel W.	E, 5th Maine Inf.	Private	44	Maine	69	40 00	General debility	Oct. 12, 1913
Taylor, Thomas H.	G, 17th Mass. Inf.	Private	18	England	54	40 00	Rheumatism	July 4, 1894
Taylor, William H.	K, 6th Cal. Inf.	Private	14	Indiana	58	35 00	Heart trouble	May 15, 1905
Thomas, Alfred J.	A, 2d Cal. Cav.	Private	22	Wales	74	38 00	Dislocated shoulder	Jan. 6, 1904
Thomas, George H.	C, 2d Ill. Vol. Inf.	Private	12	Kentucky	49		Partial paralysis	Nov. 13, 1918
Thomas, James H.	Band, 28th U. S. V. Inf., etc.	Corporal	36	New York	63	20 00	Partial paralysis	Nov. 12, 1913
Thomas, John W.	A, 53th Pa. Inf.	Private	45	Wales	72	40 00	Nervousness	Oct. 3, 1914
Thomas, Lewis	M, 1st Ind. Heavy Art.	Private	28	Missouri	58	40 00	Rheumatism	Jan. 22, 1904
Thompson, Almer	H, 122 N. Y. Inf.	Corporal	23	Maryland	67	55 00	Loss right arm	April 25, 1911
Thompson, Charles E.	G, 1st Cal. Vol. Inf.	1st Lieutenant	16	California	62		Lame from old fracture	May 26, 1919
Thompson, William H.	C, 43d Wis. Inf., etc.	Corporal	31	New York	80	40 00	Hernia	Jan. 2, 1917
Thorp, John B.	B, 2d Cal. Inf.	Private	17	Texas	72	35 00	Hemorrhoids	Sept. 22, 1918
Thurston, George	H, 86th Ill. Inf.	Private	28	Indiana	65	40 00	Rupture	Feb. 10, 1910
Titus, Lewis	5th Indpt. Bat. Wis. Lt. Art.	Private	15	Vermont	63	30 00	General debility	Oct. 28, 1897

DESCRIPTIVE LIST OF MEMBERS OF THE VETERANS' HOME OF CALIFORNIA—Concluded.

Name	Company and regiment	Rank	Length service, months	Nativity	Age when admitted	Pension per month	Disability	When admitted
Toole, John	D, 11th Mass. Lt. Art.	Private	7	Pennsylvania	55	30 00	Piles	Jan. 1, 1905
Tremblay, Cyprion	I, 20th Mass. Inf.	Private	20	Canada	63	35 00	Lame left shoulder	Feb. 10, 1910
Tremper, Edgar	K, 2d Wis. Cav.	Corporal	46	New York	69	40 00	Rupture	Mar. 22, 1912
Trengove, William H.	D, 1st Bat. Nev. Vol. Inf.	Private	4	California	47		Pulmonary tuberculosis	Aug. 8, 1919
True, Charles S., alias Charles T. Shaw	U S. Navy	Landman	14	Maine	71	35 00	Partial blindness	Sept. 13, 1918
Tuek, John W.	G, 28th Ill. Inf.	Private	23	Maine	65	30 00	Partial paralysis	Sept. 27, 1910
Tussee, William	F, 30th Mo. Inf.	Private	12	Missouri	65	32 00	Partial paralysis right hand	July 16, 1911
Tuttle, Stephen A.	E, 1st Mich. S. S.	Corporal	25	New York	73	40 00	Throat trouble	June 9, 1920
Twitchell, George W.	A, 47th Ill. Inf.	Corporal	28	Maine	63	40 00	Varicose veins	Dec. 5, 1908
Tyler, Chauncey A.	A, 16th Iowa Inf.	Private	19	Iowa	64	38 00	Lumbago	April 20, 1909
Upton, Robert T.	K, 30th Mich. Inf.	Private	8	Ohio	53	32 00	Lumbago	Nov. 4, 1898
Ursenbach, Louis F.	Band, 3d U. S. Art.	Corporal	31	Switzerland	35	12 00	Bronchitis	Dec. 12, 1901
Van Camp, Belas	E, 3d Mich. Cav.	Bugler	53	Indiana	56	40 00	Rupture	Mar. 15, 1899
Van Deventer, George W.	E, 2d Mich. Inf.	Private	39	Michigan	73	40 00	Age	July 15, 1915
Venn, Samuel	U. S. Navy	Seaman	181	England	49	12 00	Tuberculosis	Oct. 14, 1913
Vogler, Remiguis	I, 41st N. Y. Inf.	Private	24	Switzerland	65	38 00	Rheumatism	Dec. 31, 1909
Voorheis, George L.	D, 22d Wis. Inf.	Sergeant	34	New York	73	40 00	Age	July 1, 1918
Wake, Alfred	I, 15th Kans. Cav.	Private	25	Illinois	73		Rheumatism	Aug. 12, 1918
Waldron, George W.	C, 1st Bat. Cal. Vol. H. A.	Private	11	California	49		Neuritis	Mar. 21, 1912
Walker, William B.	H, 3d U. S. Art.	Corporal	60	Georgia	49		Myocarditis	Jan. 29, 1913
Wallin, William	Henshaw's Bat., Ill. Lt. Art.	Private	33	Illinois	73	40 00	Age	Oct. 22, 1917
Walsh, John	Unassigned, 17th Mich. Inf.	Private	1	Ohio	68		Nervous trouble	Jan. 17, 1918
Wamsley, John H.	F, 22d Ind. Inf.	Private	45	Indiana	80	40 00	Stomach trouble	Nov. 2, 1916
Ward, Charles H.	B, 43d Ill. Inf.	Private	35	Germany	76	40 00	Shortened right leg	Dec. 5, 1914
Warren, John H.	C, 1st Cal. Heavy Art.	Private	7	California	38		Rheumatism	Mar. 22, 1912
Warren, Julian B.	B, 1st Bat. Cal. H. A.	Private	6	New York	72	35 00	Rheumatism	Jan. 2, 1908
Wat, Joseph A.	H, 2d U. S. Art.	Musician	35	California	36		Deafness	May 12, 1916
Weaver, Lafayette	E, 14th Pa. Cav., etc.	Private	25	Ireland	72	40 00	Heart trouble	April 6, 1920
Weiman, Joseph	F, 7th Ohio Inf.	Private	4	Pennsylvania	54	40 00	Fracture of ankle	May 7, 1899
Weingart, Matthew	C, 72d Ill. Inf.	Private	20	Ohio	70	30 00	Lame back	Nov. 6, 1912
Wentworth, Nathaniel S.	L, 3d N. J. Cav.	Private	10	Germany	69	38 00	Age	Sept. 30, 1915
	B, 38th Mass. Inf.	1st Sergeant	39	New Hampshire	67	40 00	Rheumatism	June 29, 1910
					73		Varicose veins	Sept. 29, 1920

Wentworth, Orrin S.	I, 26th Maine Inf., etc.	Private	18	Maine	57	38 00	Heart and kidney disease.	Sept. 9, 1903
Werner, Gottlieb.	H, 94th N. Y. Inf.	Private	55	Germany	58	40 00	Lame foot.	June 4, 1899
Wescott, Harrison.	I, 7th Maine Inf.	Private	30	Maine	73	40 00	Age	Mar. 28, 1916
West, Daniel J.	H, 1st Conn. Inf., etc.	1st Lieutenant	45	New York	57	40 00	Age	June 8, 1918
Wetsell, George W.	U. S. Navy.	Drummer	66	New York	57	40 00	Bronchitis	Nov. 30, 1902
Whiser, Abraham.	K, 12th Ohio Inf.	Private	50	Ohio	74	40 00	Age	May 15, 1915
White, Thomas F.	D, 1st Nev. Vol. Inf.	Private	3	Massachusetts	50	---	Injury left arm	Sept. 16, 1908
Whitlatch, Clarence.	125th Coast Art.	Private	35	Indiana	36	---	Loss both feet.	Jan. 24, 1918
Whitlock, William H. H.	F, 7th Cal. Inf.	Private	35	Michigan	73	35 00	Rupture	Mar. 11, 1914
Whitney, Henry H.	H, 105 N. Y. Inf.	Sergeant	16	New York	59	40 00	Rheumatism	June 21, 1900
Whitworth, Joseph P.	H, 1st Ore. Inf.	Private	34	Illinois	76	35 00	Age	Jan. 22, 1920
Widten, Charles.	U. S. Navy.	Seaman	97	Massachusetts	68	40 00	Rheumatism	Nov. 17, 1908
Wilde, John H.	A, 63d Ill. Inf.	Private	35	England	77	40 00	Cancer of mouth.	May 1, 1917
Wiley, Granville.	U. S. Navy.	Act. 3d A. Eng.	38	New Hampshire	71	40 00	Rheumatism	Oct. 15, 1908
Wiley, Henry O.	G, 14th Maine Inf., etc.	1st Lieutenant	29	Maine	75	40 00	Blindness	May 4, 1920
Williams, Charles, alias Charley Williams.	M, 8th Cal. Vol. Inf.	Private	7	Denmark	44	---	Lumbago	Oct. 3, 1901
Williams, Edgar S.	A, 133d Ind. Inf.	Private	4	Indiana	64	32 00	Rheumatism	Dec. 19, 1911
Williams, Edward, No. 1.	U. S. Marine Corps	Private	41	Ohio	42	---	Fracture right ankle.	Feb. 3, 1908
Williams, Edward, No. 2.	F, 33d Ill. Inf.	Private	8	Illinois	63	32 00	Rheumatism	Sept. 29, 1909
Wilson, George C.	B, 79th Ill. Inf.	Private	34	Indiana	76	40 00	Age	Dec. 27, 1916
Wilson, Hiram C.	F, 18th Mo. Inf.	Corporal	45	Missouri	70	40 00	Gunshot wound right leg	Mar. 19, 1913
Williams, William H.	K, 10th Ohio Vol. Inf.	Corporal	9	Michigan	57	---	Weak eyes.	Aug. 25, 1913
Wise, John H.	H, 11th Kans. Cav.	Private	14	Indiana	63	35 00	Crippled feet.	Oct. 29, 1914
Wolbach, David.	G, 4th Ill. Cav.	Private	38	Pennsylvania	80	40 00	Age deaf.	Mar. 16, 1920
Wolbrecht, Julius.	31st U. S. V. Inf.	Q. M. Sergeant	21	Germany	62	20 00	Kidney trouble.	Mar. 27, 1914
Woodford, Charles W.	B, 6th Cal. Inf.	Private	13	Indiana	77	35 00	Paralysis	July 7, 1916
Woodard, William.	A, 4th Va. Vol. Inf.	Private	12	California	48	6 00	Defective vision	Dec. 3, 1910
Woods, William B.	H, 30th Ill. Inf.	Private	15	Illinois	71	35 00	Bladder trouble.	Mar. 8, 1910
Woodward, Howard B.	A, 22d Ill. Inf.	Private	39	Wisconsin	63	40 00	Loss of left foot.	Aug. 11, 1911
Wray, John, known as John Good.	G, 1st Conn. Cav.	Private	6	Massachusetts	53	32 00	Disease of eyes.	Jan. 29, 1896
Wright, Benjamin F.	D, 45th Iowa Inf.	Private	4	Indiana	73	30 00	General debility	June 18, 1918
Writer, Orion E.	I, 57th Mass. Inf.	Private	37	Ireland	52	32 00	Kidney disease.	Sept. 14, 1896
Wulff, Gustaf.	C, 1st Cal. Vol. Inf.	Private	32	Sweden	55	---	Injury to spine	Jan. 8, 1915
Younger, Elton R.	L, 34th U. S. V. Inf.	Q. M. Sergeant	19	California	52	---	Chronic dysentery	Aug. 24, 1908
Zander, Henry D.	U. S. Hosp. Corps	Private	12	New York	55	---	Paralysis	Feb. 24, 1919
Zeller, William.	H, 1st Mont. Vol. Inf.	Corporal	31	Germany	51	---	Malaria	Dec. 2, 1918
Zerby, Jacob.	I, 46th Ill. Inf.	Private	24	Illinois	47	---	Rheumatism	July 14, 1896

Fourth Biennial Report

OF THE

California School for Girls

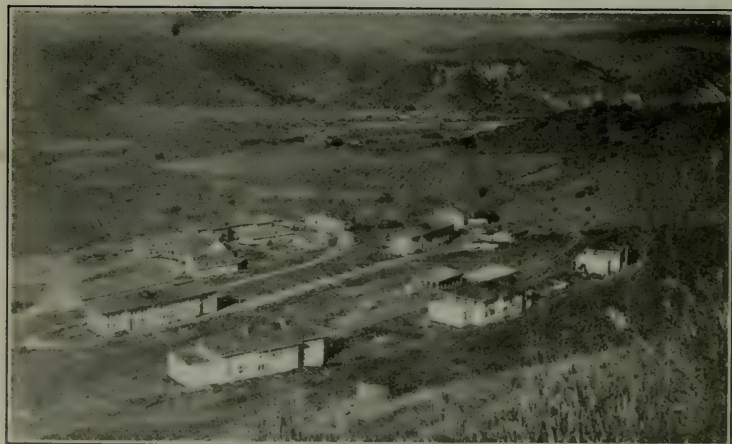
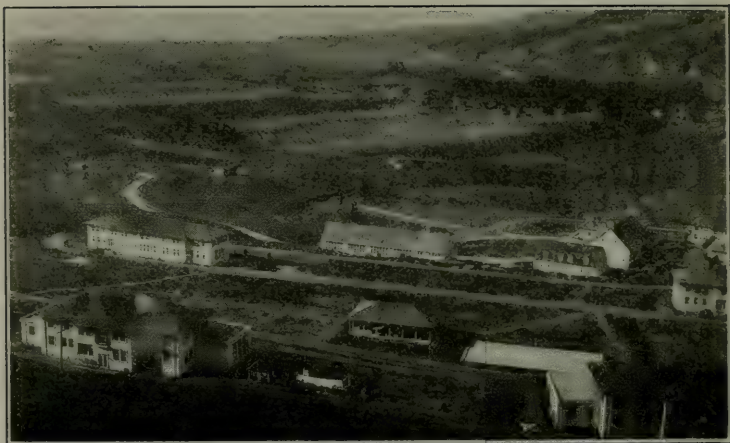
Ventura, California

FROM JULY 1, 1918 TO JUNE 30, 1920

Seventieth and Seventy-first Fiscal Years



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1921



California School for Girls.

LETTER OF TRANSMITTAL.

CALIFORNIA SCHOOL FOR GIRLS,
Ventura, California, February 8, 1921.

*To His Excellency WILLIAM D. STEPHENS,
Governor of the State of California.*

The Board of Trustees of the California School for Girls respectfully submits its fourth biennial report covering the seventieth and seventy-first fiscal years.

Since the last report, submitted June 30, 1918, one additional cottage, a domestic arts building, a gymnasium, an administration building, and a school building have been constructed and dedicated to use. At the present time, a cottage to receive girls who have broken parole is under construction, and will be ready for use within a few weeks. Plans are being drawn for the construction of another cottage which, when completed, will enable the school to care for 208 girls.

With the growth in population of the school, there has been a consequent increase in the number of officers; and with the general advance in salaries, there has been an inevitable increase in the size of the payroll.

The greatest need that the school now faces (and one which we know is shared by other similar institutions) is that for officers and teachers specially trained to work out such problems as are continually encountered in this school and in those of a like nature. The successful running of such institutions demands the skill and tact of trained specialists. This Board of Trustees respectfully urges the establishment by the state of a school wherein special training shall be given those who are temperamentally suited for work in the various public welfare institutions of the state. California could offer no greater service to society at large and in particular to those of its own citizens needing special care, safeguarding and training because of inherited or acquired traits, than by the establishment of such a school.

The Board of Trustees keenly feels that, could the public become convinced of the fact that society is responsible for the conditions that make such schools as our own a necessity, and that each inhabitant of the state is individually responsible so far as his own influence extends, the school would have the cooperation it so greatly desires from the citizenry of the state. It would receive the just and constructive

criticism that makes for the welfare and proper functioning of such an institution. The cooperative thought of the public, rather than the antagonistic state of mind, is vitally essential to the fine morale which we so desire for our school.

May we, in conclusion, commend the policy of our Superintendent, Mrs. Mary A. Hill. She has a vision of an institution in which the individual girl and her own peculiar needs are paramount—an institution which shall, by its watchful and wise care and training, turn back into the world citizens who shall maintain themselves honorably and usefully when they reenter society. To this end, her endeavor at all times has been to work out methods which shall recognize the needs of the individual, and to develop in the girls self-reliance, self-respect and belief in their own powers and responsibilities.

Respectfully submitted.

MRS. D. G. STEPHENS.

MRS. L. B. HOGUE.

MRS. PAUL DOWNING.

MRS. CHARLES H. TOLL.



View Across the Valley From the School.

BIENNIAL REPORT OF THE SUPERINTENDENT TO THE BOARD OF TRUSTEES.

LADIES:

PURPOSE OF THE SCHOOL.

Both to understand and to do the work of a school like the California School for Girls, the purpose of the work must be kept in mind. This purpose we explain in season and out of season to officers, to girls, to state boards, to courts, to visitors, is to set the girls' feet on the road to right citizenship.

LIFE OF THE SCHOOL.

Inasmuch as we become only by being, we ask both officers and girls of the School to be good citizens in the School itself, and this attitude of right citizenship determines the life of the School. Into the texture of this life enter the threads which enter into the life of the good citizen everywhere. Some of these are the building and maintaining of sound bodies, useful work, vital schooling, wholesome play, respect for law, practical religion, beauty, hope, vision.

(1) The Building and Maintaining of Sound Bodies.

To this end each girl entering the school is kept in isolation until nose and throat cultures have been examined. Girls with venereal disease are segregated for treatment under one roof. Syphilitic girls are about to be received and treated by the most approved methods. An oculist comes biweekly to examine eyes and fit glasses. A state dentist visits at frequent intervals, his work supplemented between times by a dentist from Ventura. A small hospital ward receives those who need attention of various sorts. A hydrotherapy department gives twenty to fifty baths daily to girls who seem nervous and irritable. A surgical room is used for tonsilectomies and other minor surgery. Regular inspections, carefully followed up, are made of the sanitary conditions of every part of the School and of the personal hygiene of the girls. Diet standards, set by the school physician under the supervision of the State Board of Health, are administered by a trained dietitian. Regular exercise in gymnasium and out of doors is insisted on. Sound physical condition is emphasized everywhere as the basis of right conduct.

(2) Useful Work.

The pupils of the School are trained in the kinds of work every woman's life is likely to require of her, carrying on in the course of this training the actual work of the School. Each of the six cottages of the School is a complete unit, in which the girls are taught to do the cleaning, the cooking, the pantry and dining room work, and the laundry. Outside the cottages, in well equipped sewing rooms, every girl is taught to make all the clothes she wears. Under garden officers, every girl is taught to plant and grow the vegetables used at the school which are also the vegetables necessary to every home. Each of these fundamental kinds of training requires a period of three months only, unless the time is lengthened by the pupils' bad behavior. In the course of this training the special aptitude of every girl is sought.

(3) Vital Schooling.

In a beautiful new school building, specially planned, each girl spends from two to four hours daily in regular school work. By the use of standardized educational tests, preceded by mental tests, the pupils are being more accurately graded and individual needs determined and met. At present in addition to two grade and one high school class—no class exceeding sixteen in number—a commercial department carries on not only training in typewriting and stenography together with other customary commercial branches, but accomplishes much of the routine stenographic work of the School, such as copying of menus and making of forms for reports. For those who are earnestly desirous of “book-learning” two small language classes have begun, one in Latin, one in French. Some commercial art work is given to those with special talent for it and some designing for the sewing department. The curriculum is being made in all our classes by the accumulation of live material from magazines, reports, advertisements, dealing with the vocations pursued by the girls in the School or likely to be adopted by them after leaving the School. In addition to this schooling domestic science classes are conducted in a series of well equipped rooms, comprising a laboratory, a small kitchen such as is found in the ordinary home, and a dining room. In the same building—the Household Arts—the theory of sewing, dressmaking, the making of children’s garments, the rudiments of home building, furnishing, and decorating are taught. In a room of adequate size at one end of the school house, off which opens a small dyeing room, four large looms for the weaving of rag rugs and a small loom for linen weaving are operated to provide the School with carpets and to teach the art and trade of weaving. In this same room basketry of various types is carried on. A class in millinery is beginning. A friend is sending us a lace pillow, bobbins and patterns for any girl who may desire instruction in lace making. Two carpenter’s benches are used by a small number of girls who enjoy this work, find it an outlet, and are able to make certain articles needed in the School or repairs.

Again in the department of education special needs are met. One girl is tutoring to enter college. Another receiving from the director of physical education special instruction in playground work.

(4) Wholesome Play.

All work and no play would be especially dangerous for girls who need varied emotional outlets. Wholesome play is essential. We have a tennis court, a basket ball court, a baseball field, a moving picture machine, by way of play equipment. Plays are frequently given by the girls of each cottage community. An operetta is now practising. At Christmas time an appropriate pageant, “The Christmas Toys,” was given first at the School and then to a Ventura County audience at a Ventura clubhouse. By the courtesy of the American Theater occasional parties go to a good “movie” in Ventura. Pienics on the beach or in near by parks, walks, club meetings, literary and otherwise, are frequent. Every house community is provided with a piano, a victrola, a library of fifty or more books, two to three good magazines,

and is urged to organize its evening recreation hour in some definite fashion. At this time such folk dances as are taught in the gymnasium are permitted.

(5) Respect for Law.

By precept and example respect for law is inculcated. Every Saturday afternoon, all the pupils of the School assemble with the Superintendent for a discussion of current events presented by the pupils themselves. After this discussion pupils who have been a month on the honor roll of the School remain. These constitute the voting body of the School and in the current month number eighty-two, over half the School. As the justifiable complaint of a single officer suffices to remove a girl's name from the honor roll, so large a number on this roll indicates steady, earnest effort on the girls' part.

This voting body elects a delegate from each cottage community to represent it on a central council of which the four heads of departments of the faculty are members and the Superintendent chairman. This council helps to create public opinion in the cottage communities and to interpret pupils and faculty mutually to each other; it will gradually take over more responsibility and the power which accompanies responsibility. Its delegates report to their respective cottages the proceedings of the council and, at need, bring before the voting body measures for action. In these steps toward self-government, however, it is not forgotten that the conduct of the School remains in the hands of the Superintendent and the officers whom she appoints.

(6) Practical Religion.

Religion, to function in daily life and as a guide to the emotions, is more necessary to a school like the California School for Girls than even sufficient food and clothing. The director of education has organized a regularly graded Sunday School which meets every Sunday morning in the assembly hall. A number of ministers of Ventura County generously give their services in turn for a meeting each Sunday afternoon. In some of the cottage communities on Sunday evening excellent Christian Endeavor Society meetings are held. At the request of Bishop Cantwell, all Roman Catholics are excluded from these meetings, having their own services and instructions in a separate room under a priest from Ventura. By the courtesy of an officer, a choir is trained to lead the singing at the larger assembly on Sunday afternoons.

(7) Beauty.

Into girls' lives, particularly, beauty must enter to create the material for right citizenship. The California School for Girls is especially blessed in the beauty of its site, which appeals to the girls, consciously and unconsciously, and about the value of which to them many continue to write long after they have left the school. Well constructed buildings, well placed; furniture made on simple lines; good pictures; lessons in music secured for us by the Ventura County group of Collegiate Alumnae, are added elements of beauty. The School greatly needs, however, at least one special teacher of art and music to develop the sense of beauty in the lives of the girls more continuously and fully.

(8) and (9) Hope and Vision.

The girls are constantly taught that, having been sent to the School by the courts of California, they are at the School to be trained into good citizens; that honorable self-support is required of them by the state; that service goes hand in hand with joy; and that happy marriage is one of the noblest means to these ends. Only after a minimum training of two years and with a good conduct record for the major part of that time is any girl recommended for parole. Parole is to either a northern or a southern district, each under the supervision of an officer of the School, who finds both home and employment for the girl paroled. One of the great needs of the School is for a wise extension of its parole system in order that its pupils at this critical testing of their powers and training may never be without a "big sister" immediately at hand. Of the forty-nine girls on parole at this writing 69 per cent are doing well or fairly well, an average which is maintained steadily. As for vision beyond that entertained for the individual pupils of the School, may we not cherish the vision of a society in which heredity will be so controlled that children will not be born with handicaps that can not be overcome and in which home, school, amusements, church, courts—all factors of environment, in short—will so function that segregation of young girls in schools like the California School for Girls will be unnecessary? This goal, in fact, is the goal of right citizenship as right citizenship is the goal of every function of the California School for Girls.

Respectfully submitted.

MARY A. HILL,
Superintendent.

Ventura, California, February 8, 1921.

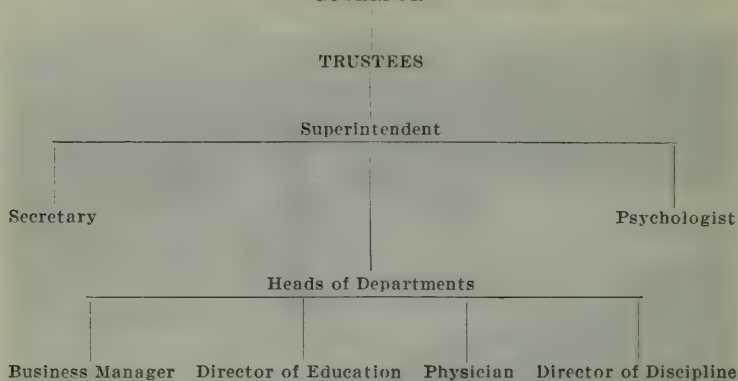


Scene From an Historical Pageant.



Scenes From an Historical Pageant.

CALIFORNIA SCHOOL FOR GIRLS.

Organization of Departments of Administration of School.
GOVERNOR

PSYCHOLOGICAL WORK AT THE CALIFORNIA SCHOOL FOR GIRLS.

(JANUARY TO JULY, 1920.)

By the California Bureau of Juvenile Research.

HISTORICAL SUMMARY.

The beginning and early development of psychological work at the California School for Girls, under the direction of Dr. Grace M. Fernald, is admirably set forth in the previous biennial reports of the School. The report for 1914-16 makes the interesting comment that

One of the first steps taken by the board of trustees after the establishment of the California school for Girls was the provision for the psychological examination of every girl.

In the first report Dr. Fernald describes the results of intelligence tests applied to 135 girls, the classifications being as follow:

Moron	32 cases or 24 per cent*
Borderline	16 cases or 12 per cent*
Normal and low normal.....	69 cases or 51 per cent
Unusual ability	18 cases or 13 per cent

*36 per cent defective.

The second report described the results of 131 tests, with the following classification:

Moron	25 cases or 19.0 per cent*
Borderline	20 cases or 15.3 per cent*
Low normal	34 cases or 26.0 per cent
Normal	46 cases or 35.1 per cent
Unusual ability	3 cases or 2.2 per cent
Doubtful	3 cases or 2.2 per cent

*34.3 per cent defective.

All of these intelligence tests were supplemented with special mental and educational tests, and were followed up by observations on individual progress. There has been evidenced a desire on the part of the administration of the School during the past six years to base instruction and training of the girls on the results of the psychological work.

THE WORK OF THE PRESENT BIENNIUM.

In January, 1920, at the request of Superintendent Mary A. Hill, the psychological work of the School was taken over by the California Bureau of Juvenile Research. At the end of the biennial period ninety-two intelligence tests had been applied, the results of which are herewith presented. The examinations were made by Miss Julia Mathews, in accordance with the standardized procedure of the Bureau.

The Stanford Revision of the Binet-Simon Scale for Measuring Intelligence was used in each case. The results of each test are expressed in terms of (a) mental age, (b) intelligence quotient, (c)

classification, and (d) probable limit of development. The examiner makes an analysis of the test findings and observations during the interview. Before arriving at a diagnosis a careful study is made of whatever social data are obtainable. These supplementary facts are summarized under the headings of chronological data, intelligence, other mental conditions, physical condition, temperament, moral character, conduct, associates, amusements, education, vocational record, home conditions, neighborhood conditions and family history. The complete preliminary summary of research data is then typed in a form suitable for filing and sent to the superintendent.

The results of the tests expressed in the comparative ages and mental ages of the ninety-two girls examined are shown in the accompanying chart. The relationship illustrates the now well established facts regarding the intelligence of delinquent and dependent persons. The actual ages, as shown in the chart, range from 13 to 20 years, averaging 17; the mental ages range from 8 to 18 years, averaging 13. This indicates a general retardation of approximately four years. The intelligence quotients (I. Q.) of these cases range from .53 to 1.18, representing a wide variation of intellectual capacity, and suggesting one of the most difficult problems which the School has to face, namely, the devising of a system which can be adapted to girls of superior intelligence on the one hand, and to feeble-minded girls on the other. The average intelligence quotient for this group is .83.

The classification, by social intelligence groups, is as follows:

Superior	5 cases, or 5.4 per cent
Average-normal	23 cases, or 25.1 per cent
Dull-normal	17 cases, or 18.5 per cent
Borderline	23 cases, or 25.1 per cent
Feeble-minded	24 cases, or 26.0 per cent

The foregoing classification is based on the method used by the Bureau of Juvenile Research and follows closely the generally accepted psychological practice, in view of what is known regarding the significance of intelligence tests for practical diagnosis. This method is based on the intelligence quotient, interpreted in the light of supplementary social data. The *superior* group for these cases includes those having an I. Q. of 1.10 or higher. The *average-normal* group includes girls testing from .89 to 1.10; the *dull-normal* group includes girls testing from .82 to .92; the *borderline* group includes girls testing from .71 to .83; the *feeble-minded* group includes girls testing below .75, the lowest in this series being .53.

PRACTICAL APPLICATIONS OF PSYCHOLOGICAL WORK.

The work as now organized is a part of the program of the state relative to the scientific study of its public wards. The Bureau of Juvenile Research has adopted standardized methods through which uniform and comparable work can be carried on in each institution in which a laboratory is maintained. The practical applications of this work are many and varied. Research activities are becoming to be widely used in connection with the institution work of all leading states and it is safe to predict that every state in the near future will have a

research organization for the study and classification of the persons whose social adjustments depend upon public supervision or special training.

One of the immediately applicable results of psychological tests is the relation the laboratory findings bear to vocational and schoolroom training which should be the center of the institution work. It is now possible, by reason of recent comparative researches, to predict, within reasonable limits, the probable intellectual development of individuals whose present status we learn through psychological tests. Mental development, like every other natural process, follows an orderly procedure. The laws of mental growth are now sufficiently well understood that we can safely rely upon the psychological laboratory for predictions of intellectual achievement. Since educational and vocational development must follow the growth of the intellectual processes, the test findings are of special significance.

A very necessary and important phase of institution work is that which pertains to segregation and moral training. Institutions are no longer rightly looked upon as complete and independent organizations, but rather as fulfilling a special part of the state program for special training which is not obtained in the public schools. Likewise, each institution must maintain means of segregating its pupils according to their individual needs. The cottage system at the California School for Girls is a recognition of this part of the problem, and this form of equipment is coming to be the accepted standard for the leading institutions. In this segregation the findings of the psychological laboratory also lend themselves to immediate practical application. The officers of the School, almost without exception, testify to the greater ease with which difficult problems of segregation and discipline can be handled because of the information revealed by the psychologist.

In the work of the parole officers a third important application of the work is recognized. The chief problem of the School is social reconstruction. It must return to society its former misfits, with the cause for the misfitting removed as far as possible, and the substitution therefor of a desirable point of view. But the testing of the results of the training in this direction rests in the work of the parole officers, whose supervision must carefully supplement the work done at the School. With a knowledge of the psychological findings, together with the related social and historical facts, the assignment to parole and the subsequent oversight which the School must exert should be greatly facilitated.

A fourth, and perhaps the most important application of this work, is the part it contributes to the scientific study of human problems. Society has long suffered the disastrous consequences of juvenile delinquency, mental deficiency, and other forms of maladjustment to the requirements which civilization places upon the human race. The work of institutions is dedicated to the relatively few who, by reason of factors little known or understood, do not abide by these requirements. The Bureau of Juvenile Research has undertaken the scientific study of some of these problems, and the work done at the School will enrich the data being gathered to this purpose.

The Bureau wishes to acknowledge the friendly cooperation secured at the California School for Girls.

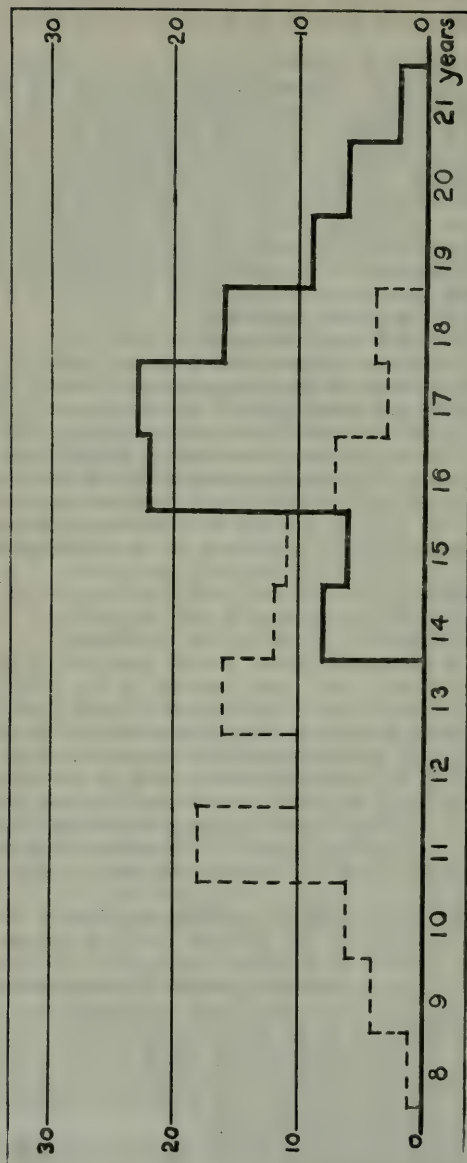


FIG. 1. Distribution of ages and mental ages of 92 girls examined by the Bureau of Juvenile Research: Heavy black line indicates chronological ages; dotted line, mental ages.

MOVEMENT OF POPULATION FOR YEAR ENDING JUNE 30, 1919.

Statement of Actual Population in Institution.

In institution at midnight June 30, 1918.....	123
---	-----

Received during year July 1, 1918, to June 30, 1919:	
--	--

By new commitments.....	57
By return from parole.....	17
By return from furlough.....	4
By return from escape.....	1
By transfers.....	0
By voluntary admissions.....	0

Total received.....	79
---------------------	----

In institution during year.....	202
---------------------------------	-----

Passed out during year:	
-------------------------	--

By discharge.....	8
By expiration of sentence, term or commitments.....	5
By parole.....	54
By furlough.....	9
By escape.....	5
By transfer.....	2
By death.....	1

Total passed out.....	84
-----------------------	----

Total population at end of year.....	118
--------------------------------------	-----

Statement of Paroles.

On parole at midnight June 30, 1918.....	62
--	----

Paroled during the year.....	58
------------------------------	----

Total on parole during year.....	120
----------------------------------	-----

Discharged from parole.....	16
Term expired on parole.....	18
Returned from parole.....	17
Died on parole.....	0
Removed from parole.....	0

Total.....	51
------------	----

On parole at end of year.....	69
-------------------------------	----

Statement of Furloughs.

On furlough at midnight June 30, 1918.....	5
--	---

Furloughed during the year.....	9
---------------------------------	---

Total on furlough during the year.....	14
--	----

Discharged from furlough.....	0
Returned from furlough.....	4
Died on furlough.....	0
Term expired on furlough.....	1
Removed from furlough.....	4

Total removed from furlough during year.....	5
--	---

On furlough at end of year.....	5
---------------------------------	---

MOVEMENT OF POPULATION FOR YEAR ENDING JUNE 30, 1920.

Statement of Actual Population in Institution.

In institution at midnight June 30, 1919	118
Received during year July 1, 1919, to June 30, 1920:	
By new commitments	77
By return from parole	30
By return from furlough	6
By return from escape	22
By transfers	1
By voluntary admissions	0
Total received	136
In institution during year	254
Passed out during year:	
By discharge	2
By expiration of sentence, term or commitments	3
By parole	56
By remand to court	3
By furlough	8
By escape	23
By transfer	9
By death	1
Total passed out	105
Total population at end of year	149

Statement of Paroles.

On parole at midnight June 30, 1919	69
Paroled during the year	56
Transferred from furlough to parole	3
Total on parole during year	128
Discharged from parole	20
Term expired on parole	17
Returned from parole	30
Died on parole	0
Removed from parole	0
Total	67
On parole at end of year	61

Statement of Furloughs.

On furlough at midnight June 30, 1919	5
Furloughed during the year	8
Total on furlough during the year	13
Discharged from furlough	0
Returned from furlough	6
Died on furlough	0
Term expired on furlough	0
Removed from furlough	4
Total removed from furlough during year	10
On furlough at end of year	3

STATEMENT OF EXPENDITURES FOR THE PERIOD JULY 1, 1918, TO
JUNE 30, 1919—SEVENTIETH FISCAL YEAR.

	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Total
Support and Subsistence:					
Feeding	\$10,616 97	\$1,279 84	-----	\$1,392 29	\$13,289 10
Clothing	1,635 55	370 00	\$306 30	7 10	2,348 95
Housekeeping	297 74	-----	-----	800 64	1,098 38
Laundry	618 49	90 00	-----	63 57	772 06
Totals	\$13,198 75	\$1,739 84	\$306 30	\$2,263 60	\$17,508 49
Care and Welfare:					
Attendance	-----	\$8,655 75	\$0 36	-----	\$8,656 11
Medical care	\$247 88	1,855 68	623 70	\$222 23	2,949 49
Personal care	146 45	-----	25	-----	146 70
Religion and education	126 55	4,790 84	-----	151 93	5,069 32
Amusement and recreation	-----	-----	-----	-----	-----
Paroles and discharges	62 80	2,100 00	598 44	-----	2,761 24
Escapes	-----	60	-----	-----	60
Totals	\$583 63	\$17,402 87	\$1,222 75	\$374 16	\$19,583 46
Maintenance of Buildings, Grounds:					
Carpentering	\$94 55	\$579 03	-----	\$33 43	\$707 01
Gardening	14 85	-----	-----	257 19	272 04
General repairs	520 28	16 00	\$128 76	92 75	757 79
Painting	-----	30 00	-----	-----	30 00
Totals	\$329 63	\$625 03	\$128 76	\$383 37	\$1,766 84
Farming:					
Dairy	\$175 74	\$587 83	\$100 00	\$10 30	\$873 87
Farm	497 44	2,812 18	164 90	203 14	3,677 66
Hog ranch	2,542 65	700 00	-----	11 59	3,254 24
Poultry ranch	301 47	552 39	-----	-----	853 86
Totals	\$3,517 30	\$4,652 40	\$264 90	\$225 03	\$8,659 63
General:					
Board of trustees	-----	-----	\$670 81	-----	\$670 81
Superintendent	-----	\$4,442 50	413 23	-----	4,855 73
Secretary	\$147 00	2,779 07	63 77	\$404 00	3,393 84
Commissary	16 43	821 94	-----	157 15	995 52
Automobile	627 00	-----	46 00	1,539 68	2,212 68
Freight, cartage and express	-----	-----	123 46	190 00	313 46
Light, heat and power	1,202 85	1,160 83	4,109 37	89 46	6,562 52
Water	-----	-----	219 77	-----	219 77
Telephone and telegraph	-----	-----	480 41	-----	480 41
Postage	-----	-----	192 00	-----	192 00
Refrigeration	55 55	-----	21 23	-----	77 78
Fire protection	-----	-----	-----	630 00	630 00
Stores breakage	6 10	-----	-----	-----	6 10
Stores adjustment	-----	-----	96 30	-----	96 30
Miscellaneous expenses	20 43	-----	455 92	-----	476 35
Totals	\$2,076 37	\$9,204 34	\$6,895 27	\$3,010 29	\$21,186 27
Totals	\$20,005 78	\$33,624 48	\$8,817 93	\$3,256 45	\$63,704 69
Additions and Betterments:					
Real estate	-----	-----	-----	\$50 00	\$50 00
Structures	\$370 25	-----	-----	44,230 92	44,601 20
Nonstructural improvements	6,368 57	-----	-----	-----	6,368 57
Totals	\$6,738 85	-----	-----	\$44,280 92	\$51,017 77
Total expenditures	\$26,742 63	\$33,624 48	\$8,817 93	\$50,537 37	\$119,722 46

FARM PRODUCTIONS, ETC., FOR YEAR ENDING JUNE 30, 1919.
Farm, Garden and Live Stock.

1. Value of farm products grown and used in institution.....	\$3,930 29
2. Value of farm products grown and sold.....	106 95
3. Receipt from other activities of the institution, and sale of junk, etc.....	758 75
Total.....	\$9,795 99

STATEMENT OF EXPENDITURES FOR THE PERIOD JULY 1, 1919, TO
JUNE 30, 1920—SEVENTY-FIRST FISCAL YEAR.

	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Total
Support and Subsistence:					
Feeding	\$13,375 87	\$1,614 00	\$84 51	\$1,314 33	\$16,588 71
Clothing	3,833 85	555 00	192 50	20 63	4,622 01
Housekeeping	479 29		25 00	2,708 55	3,212 84
Laundry	640 74	20 75		869 52	1,531 01
Totals.....	\$18,529 75	\$2,189 75	\$302 01	\$4,913 06	\$25,934 57
Care and Welfare:					
Attendance	\$0 75	\$14,781 09	\$75 00	\$1 10	\$14,857 94
Medical care	466 41	2,886 51	948 21	1,748 43	5,989 56
Personal care	235 89		2 80		238 69
Education	390 83	6,407 15	430 90	460 19	7,639 07
Amusement	37 89		38 25		76 14
Paroles and discharges	63 00	2,262 50	1,263 93		3,592 43
Escapes			91 10		91 10
Totals.....	\$1,134 77	\$26,337 25	\$2,853 19	\$2,209 72	\$32,534 93
Maintenance of Buildings, Grounds:					
Carpentering	\$534 29	\$1,284 30		\$191 62	\$2,010 21
Landscape gardening	42 58			107 75	150 33
Painting	39 10			23 93	63 03
Plumbing	63 73	275 21		176 89	518 83
Totals.....	\$379 70	\$1,559 51		\$500 19	\$2,739 40
Farming:					
Dairy	\$1,036 09	\$400 00	\$36 00	\$1,114 25	\$2,636 34
Farm	926 70	3,005 01	52 39	514 71	4,498 81
Hog ranch	2,151 34	720 00		69 15	2,940 49
Poultry ranch	86 02	80 27			166 29
Totals.....	\$4,250 15	\$4,205 28	\$88 39	\$1,698 11	\$10,241 93
General:					
Board of trustees			\$904 48		\$904 48
Superintendent		\$4,498 29	109 85		4,608 14
General offices	\$331 62	4,564 32	149 97	\$93 03	5,138 94
Postage			200 26		200 26
Telephone and telegraph			772 64		772 64
Automobile	798 54		142 09	1,463 47	2,409 10
Freight, cartage and express			1,152 82		1,152 82
Light, heat and power	5,411 43	1,716 49	2,812 19	919 94	10,860 05
Water			405 35		405 35
Refrigeration	59 80		35		94 80
Stores breakage	2 69				2 69
Miscellaneous	5 02		199 23		204 25
Totals.....	\$6,600 10	\$10,779 10	\$8,849 23	\$2,481 44	\$26,718 87
Total general expenditures.....	\$31,203 47	\$45,070 89	\$10,092 82	\$11,802 52	\$98,169 70
Additions and Betterments:					
Buildings and repairs	\$297 36			\$89,154 58	\$89,451 94
Total expenditures.....	\$31,500 83	\$45,070 89	\$10,092 82	\$100,957 10	\$187,621 64

FARM PRODUCTIONS, ETC., FOR YEAR ENDING JUNE 30, 1920.

Farm, Garden and Live Stock.

1. Value of farm products grown and used in institution-----	\$7,299 06
2. Value of farm products grown and sold-----	1,438 67
3. Receipts from other activities of the institution, and sale of junk, etc.-----	28 00
Total-----	\$8,765 73

STATE CLAIMS AGAINST COUNTIES FOR MAINTENANCE OF INMATES—

JULY 1, 1918, TO JUNE 30, 1920.

1918—		1919—	
July -----	\$1,354 06	July -----	\$1,640 99
August -----	1,352 99	August -----	2,363 24
September -----	1,303 87	September -----	2,433 88
October -----	1,312 89	October -----	2,460 65
November -----	1,326 24	November -----	2,373 83
December -----	1,306 13	December -----	2,340 01
January -----	1,277 05	January -----	2,416 19
February -----	1,322 90	February -----	2,446 09
March -----	1,356 88	March -----	2,542 59
April -----	1,319 67	April -----	2,672 55
May -----	1,310 75	May -----	2,833 54
June -----	1,304 98	June -----	2,985 91
Total-----		Total-----	\$45,357 88

FIFTH BIENNIAL REPORT

OF THE

Reclamation Board of California

1919 and 1920



CALIFORNIA STATE PRINTING OFFICE

SACRAMENTO, 1921

LETTER OF TRANSMITTAL.

SACRAMENTO, CALIFORNIA, December 31, 1920.

To His Excellency, HONORABLE WM. D. STEPHENS,
Governor of California.

SIR: The Reclamation Board of California herewith offers you for your consideration a report upon the progress and status of flood control plans and works within the Sacramento and San Joaquin Drainage District for the calendar years 1919 and 1920.

Respectfully submitted.

THE RECLAMATION BOARD,

A. B. FLETCHER, *President.*

A. G. FOLGER, *Vice President.*

PETER COOK.

FRANK FREEMAN.

G. A. ATIHERTON.

G. C. SHANNON.

M. C. ZUMWALT.

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CHAPTER I.

RECLAMATION AND FLOOD CONTROL ENACTMENT BY THE LEGISLATURE OF 1919 AFFECTING THE SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT.

HISTORY OF STATE AND GOVERNMENT ENACTMENT.

Chapter 1 of the Fourth Biennial Report of the Reclamation Board of California, dated December 31, 1918, records chronologically and specifically the various congressional and legislative enactments in connection with flood control matters in California from the beginning in 1850 up to and including 1918.

LEGISLATIVE ENACTMENT BY THE LEGISLATURE OF 1919.

The approved legislative enactment of 1919 includes six chapters or acts, some of which are general, while others are special in their nature, being appropriations toward specific portions of the flood control plan of the Sacramento Valley. These six acts are as follows:

Chapter 523 (Act 3035 of the General Laws).

Amendments and additions to the Reclamation Board Act.

Chapter 7 (Act 3036 of the General Laws).

Authorizing the State Board of Control to purchase Sacramento and San Joaquin Drainage District warrants against Sutter-Butte By-pass Assessment No. 6.

Chapter 520 (Act 3036a of the General Laws).

Providing for the bonding of a project district for extending over a period of years the payments of assessment levied for the construction of the project.

Chapter 519 (Act 3036b of the General Laws).

Providing for the conveyance by the state to the Sacramento and San Joaquin Drainage District, or to the United States, of lands acquired for flood control purposes in the Sacramento and San Joaquin valleys.

Chapter 556 (Act 3036c of the General Laws).

Providing for the appropriation of \$3,000,000 by the State of California, as its cooperation in the construction of the public works included in Sutter-Butte By-pass Project No. 6.

Chapter 463 (Act 3818d of the General Laws).

Providing for the appropriation of \$500,000 by the State of California towards the continuation of the enlargement of the lower Sacramento River during the next succeeding two years.

RESUME OF ABOVE LEGISLATION OF 1919.

CHAPTER 523—ADDITIONS TO RECLAMATION BOARD ACT.

These additions include amendments to sections 12 and 13 to the Reclamation Board Act as adopted in 1911 and amended in 1913 and 1915, together with four new sections, known as sections 32, 33, 34 and 35.

Section 12 of the Reclamation Board Act defines the general powers of the Reclamation Board, and the amendments made in 1919 include:

First—The enlargement of the powers of the Reclamation Board to definitely and specifically include the power to acquire lands, rights of way, material, etc., for drainage purposes, and to construct and operate all drainage works, including canals, pumping plants, etc., made necessary by the adoption of projects or units of the flood control plan.

Second—The power to secure lands and rights of way for, and to convey the same to, the State of California, free of cost, for the construction of flood control works.

Third—Provision for the contribution of funds by the Reclamation Board to the United States Government for public improvement of rivers and harbors, within the provisions of the United States River and Harbor Act of March, 1915, whenever such work would otherwise have been performed by the Reclamation Board under the provisions of the Reclamation Board Act.

Section 13 of the Reclamation Board Act fixes the process of levying assessments and the division into projects or units for the purpose of levying such assessments.

The amendments and additions to section 13, as passed by the legislature of 1919, are as follows:

First—The increasing of the assessment levied by the Reclamation Board so that it will include the expenses of bonding such assessment if authorized by law.

Second—Provision for including in any project the permanent handling and disposal of all natural drainage waters which may be intercepted or affected by the construction of flood control works undertaken by the state under such project.

Third—Clarification and amplification of verbiage in connection with estimates and assessments for projects.

Fourth—The addition of a paragraph to make clear that assessments for benefits shall be based upon benefits which may accrue from the construction of the entire works embraced in a project considered as a whole, and lands shall not be considered benefited by the entire project simply because they have been or may be first endangered or flooded, or the natural drainage obstructed, by or because of the construction or maintenance of any part of the project in advance of the completion of the entire works embraced in the project.

Fifth—A specific condition inserted in connection with the modification or amendment of assessments by the Reclamation

Board, after sitting as a board of equalization, to the effect that no reapportionment of an assessment shall be deemed necessary unless the aggregate amount of the modifications or amendments of the same by the Reclamation Board shall exceed two and one-half per cent of the original total amount of such assessment.

Section 32 is an entire new section providing that for the sake of information and record the assessors shall divide assessments as between flood control benefits and other benefits, but that this division shall in no way affect the total assessment, although it shall be subject to review and readjustment in the same manner as the assessment itself.

Section 33 is a new section which provides that any compensation which may be made by the Sacramento and San Joaquin Drainage District for flood control works turned over to it for permanent maintenance, shall be applied toward the payment of any Reclamation Board assessment still remaining unpaid by the district, association, corporation, person, etc., turning over said flood control works.

Section 34 is a new section providing that moneys paid by the State of California to the Reclamation Board under the terms of chapter 556, Statutes of 1919, or laws of similar import, shall be credited pro rata to the assessments for flood control benefits of Sutter-Butte By-pass Project No. 6, and details the manner of applying such credits. It also provides that such moneys received by the Reclamation Board from the state shall be deposited with the State Treasurer and applied towards the redemption of warrants, excepting in projects where bonds shall have been authorized by law, in which cases such moneys appropriated by the state shall be applied to the purchase or redemption of outstanding bonds.

Section 35 is a new section which provides that when the amount of the accrued interest is certified by the State Controller on the back of a registered warrant of the Sacramento and San Joaquin Drainage District, the State Treasurer shall pay such certified accrued interest at the time that he redeems and pays said warrant.

CHAPTER 7—PURCHASE BY STATE BOARD OF CONTROL OF WARRANTS AGAINST ASSESSMENT NO. 6.

This act was considered, and in its last section specifically declared an urgency measure and was passed at the first session of the legislature of 1919, becoming effective immediately upon receiving executive approval on January 30, 1919.

It authorizes the State Board of Control to purchase at their face value, and to the extent of \$300,000, Sacramento and San Joaquin Drainage District warrants drawn by the State Controller against Sutter-Butte By-pass Assessment No. 6, and issued in payment for expense of construction of the east levee of the Sutter By-pass.

This authorization resulted in the continuation of actual construction work upon the east levee of the Sutter By-pass during the flood season of 1919, by providing for the purchase of warrants delivered to contractors for immediate emergency and construction work.

CHAPTER 520—BONDING ACT.

This act is a long one, containing fifty-eight sections, authorizing the Reclamation Board to permit landowners assessed for a given project to vote for a bond issue for the purpose of spreading the payment of such assessment over a large number of years, and providing in great detail for the issuance and sale of bonds of the Sacramento and San Joaquin Drainage District based upon assessments levied by the Reclamation Board upon lands within the district.

As the act is a very important one, and will probably be used by the Reclamation Board during the spring of 1921 in connection with the Sutter-Butte By-pass Assessment No. 6, a brief digest is given herewith below covering its salient points.

When ready to finally approve an assessment list, the Reclamation Board may, instead of calling and collecting it in installments as provided in the Reclamation Board Act, determine it to be for the best interests of the landowners to issue bonds for the payment of the costs of a project. In such case the Reclamation Board shall, within ten days, commence judicial proceedings for the validation of the assessment by filing a copy of the assessment list and order of the board with the county clerk of the county containing the largest acreage so assessed.

Thereupon the Governor shall appoint three judges from outside the Sacramento and San Joaquin Drainage District to sit en banc in such proceeding, holding their hearings between thirty and forty days after the said filing of the assessment list. The court shall hear all evidence and pass upon written objections as expeditiously as possible, and shall enter and file with the Reclamation Board its judgment, approving, amending, modifying or annulling the assessment. No new trial shall be granted or appeal allowed from said judgment.

If the court should annul the assessment then the Reclamation Board shall make a new assessment, but a reapportionment shall not be necessary unless the aggregate amount of the modifications shall exceed two and one-half per cent of the original total amount of the assessment. The Reclamation Board shall immediately make the modifications required by the court and file the amended original assessment lists with the county treasurers, whereupon such assessment shall become and constitute a lien upon the lands assessed.

The whole assessment upon any tract of land may be paid in cash, and the lien canceled, within thirty days after the filing of the assessment list. All assessments not thus paid in full, however, shall bear interest at seven per cent per annum after the expiration of said thirty-day period.

Upon the expiration of said thirty day period the Reclamation Board shall call a bond election in the district affected to determine whether or not bonds of the Sacramento and San Joaquin Drainage District shall be issued in an amount equal to the amount of the assessment then unpaid. Notices of such election must be published twenty-one days prior to the date fixed for election. The Reclamation Board shall hold the election in accordance with the details fixed by this act. Each interested landowner may cast one vote for each one cent of the amount assessed against his land.

The Reclamation Board shall canvass, determine and declare the results of the election which shall become final within ten days providing

no interested person shall have brought suit in a superior court to contest the vote or the proceedings. If the vote is against the bond issue the Reclamation Board shall proceed to call and collect the assessment in installments, but if the result is in favor of the bond issue then the Reclamation Board shall issue Sacramento and San Joaquin Drainage District bonds, in denominations ranging from one hundred to one thousand dollars, to be redeemed serially within twenty years, fixing the rate of interest at not to exceed six per cent per annum. These bonds when fully executed shall be delivered to the State Treasurer.

Within ten days after the delivery of the bonds to the State Treasurer the Reclamation Board may bring suit *in rem* in the superior court, to determine the validity of the bonds, jurisdiction being obtained by three weekly publications of summons.

Within thirty days after the completion of such publication any interested landowner may appear to attack the validity of the bonds, and precedence in the matter must be given over other civil actions. Appeal may be had within thirty days after entry of judgment by any one not in default. If the Reclamation Board does not bring such validation suit within said ten days then any other party may bring such suit thereafter.

The State Treasurer shall, when and as directed by the Reclamation Board, and after three weekly published notices, sell specified amounts of the bonds for the best price obtainable at not less than 95 per cent of their face value. Moneys derived from the sale of bonds shall be credited to the Sacramento and San Joaquin Drainage District fund and used by the Reclamation Board for constructing without unnecessary delay the project for which the bonds were issued, warrants being drawn by the State Controller upon the State Treasurer. The Reclamation Board may use any of the bonds in lieu of warrants for the payment for work on the project. If the bonds are not sold one year after the authorized date of issue the Reclamation Board may cancel all bond issue proceedings and call for the collection of the assessment in installments.

The Sacramento and San Joaquin Drainage District bonds when approved as legal investments for savings banks may be lawfully purchased by banks, insurance companies, administrators, municipalities, etc. The State Treasurer shall always keep on hand sufficient funds from the sale of bonds and otherwise for the payment of interest on outstanding bonds for the next succeeding year. He shall keep the Reclamation Board informed of the status of bond sales, redemptions, interest coupons, etc., and the Reclamation Board shall keep this record open at all times for public inspection.

The Reclamation Board may temporarily invest the surplus of the bond fund, above the amount to become due for the ensuing year, in other approved securities legally purchasable by savings banks. Whenever such surplus shall amount to twenty-five thousand dollars above the amount of bond principal and interest falling due on the next two interest dates the Reclamation Board shall use it for redeeming serially outstanding unmatured bonds. Funds shall be collected annually in two installments for interest payments on outstanding bonds with the usual penalties, delinquent sales, etc. Warrants shall not be

accepted in payment of assessments upon which bonds have been authorized.

Matured bonds, or those to mature within one year, may be used in lieu of cash for the purchase of delinquent lands. The Sacramento and San Joaquin Drainage District must purchase delinquent lands when no outside sale can be made to cover the total delinquency to date. The surplus received above that needed to satisfy delinquency shall be delivered to the landowner, who has one year after the date of delinquent sale for the redemption of his land. Delinquent lands held by the Reclamation Board after the final collection on the assessment shall be sold at public auction to the highest bidder.

The Reclamation Board shall hold for the benefit of lands assessed, and may distribute among the landowners, any surplus remaining after all of the bonds shall have been redeemed and the work completed. If the amounts collected are insufficient to redeem the bonds and pay the interest, the Reclamation Board shall levy and collect a supplementary assessment similar to, and being a percentage of, the original assessment.

No officer shall receive a fee for services in connection with bond issue or collection, but all reasonable expenses shall be paid from such fund. If the Reclamation Board members or employees or any public officer shall fail to perform the duties prescribed by this act, the Attorney General, and in case of his default the Governor, shall require performance by mandamus or other proper remedy.

CHAPTER 519—CONVEYANCE OF LAND.

This act authorizes the conveyance by the state to the Sacramento and San Joaquin Drainage District, or to the United States, upon repayment to the state of the cost thereof, of all or any part of any land, right of way, easement or weir site, acquired by the state for any work of river channel excavation, enlargement, rectification or control or for the construction of any weir, forming part of the plans approved by the state for flood control in the Sacramento or San Joaquin valleys, and reappropriating the amount so repaid to reimburse the appropriation out of which the same was paid by the state.

CHAPTER 556—STATE APPROPRIATION OF \$3,000,000 TOWARD PROJECT NO. 6.

This act provides for the appropriation by the State of California of \$3,000,000 for the purpose of cooperation in the construction of the public works included in Sutter-Butte By-pass Project No. 6, and directing the Reclamation Board to apply and use the same for the benefit of the Sacramento and San Joaquin Drainage District in connection with said Project No. 6 in accordance with law.

The manner of handling this fund is covered by chapter 523, which specifically provides (as shown above) that the moneys so appropriated by the State of California are to be applied to what are considered purely flood control (or public) works in connection with the Sutter-Butte By-pass Project No. 6.

The act provides that the total appropriation shall be paid to the Reclamation Board in ten annual installments of \$300,000 each, begin-

ning in the fiscal year commencing July 1, 1921; and that said sums shall be collected annually at the time other state revenue is collected by officers whose duty it is to collect such revenue.

CHAPTER 463—APPROPRIATION BY THE STATE OF \$500,000 TOWARD ENLARGEMENT OF LOWER SACRAMENTO RIVER.

This appropriation is one of several which have been made, and which probably will be made in the future, by the state, as its pro-rata at this particular time towards the enlargement of the Sacramento River between Rio Vista and Collinsville.

In 1917 the federal government provided for a total appropriation by it of \$5,600,000 to be made at a rate not to exceed one million dollars per year towards the enlargement of the lower Sacramento River, providing that the state also should appropriate a total of \$5,600,000.

The federal government and the state have to date each appropriated \$1,850,000 towards the above amounts, and it is estimated that the amounts appropriated in 1919 are sufficient to continue the progress of the work (under the direction of the California Debris Commission) up to August, 1921, it being assumed that the legislature of 1921 and the Congresses of 1921 and 1922 will make such appropriations as will be necessary to continue this work until August, 1923.

The act (chapter 463) specifically provides that the amount appropriated is \$500,000; that it shall be used for the controlling of the floods and for the improvement of the Sacramento River in accordance with the modified plans of the California Debris Commission, and in compliance with the act of Congress, approved March 1, 1917, providing for the control of the floods of the Sacramento River; and that it shall be paid over to the treasurer of the United States in such sums and at such times as similar appropriations are made by Congress.

CHAPTER II.

**CHANGES IN AND ACCOMPLISHMENTS BY THE
RECLAMATION BOARD DURING 1919 AND 1920.**

RESIGNATIONS AND CHANGES.

Mr. Frank Freeman, an attorney in Willows, Glenn County, California, was appointed by the Governor about the end of June, 1919, as a member of the Reclamation Board to fill the vacancy caused by the resignation of Mr. L. H. Frankenheimer, which was presented to the Governor October 15, 1917. This appointment completed the membership of the Board to its full quota of seven members, and Mr. Freeman began his duties as a member of the Reclamation Board at its meeting on July 3, 1919.

At the meeting of the Reclamation Board on July 22, 1919, Mr. W. T. Ellis resigned as secretary of the Board and Mr. Thos. Mayhew was appointed secretary pro tem. At this same meeting the office of assistant secretary was abolished and the secretary pro tem. was instructed to carry on the duties formerly handled by the secretary and assistant secretary.

Mr. C. H. Oatman, attorney for the Reclamation Board, presented his resignation as attorney at the meeting of the Board held on July 22, 1919, with his request that the same should become effective July 31, 1919. Since August 1, 1919, Mr. Frank Freeman has, upon the unanimous request of the other members, been acting as legal adviser for the Board, although no official appointment has been made of an attorney to replace Mr. Oatman.

On October 23, 1919, the term of Mr. W. T. Ellis as a member of the Board was terminated by the Governor, and at a meeting of the Board held on the same date Mr. Peter Cook was appointed a member of the finance committee in place of Mr. W. T. Ellis whose connection with the Board had just terminated. The other members of the finance committee are Mr. A. B. Fletcher and Mr. A. G. Folger. Also at the meeting of the Board on October 23, 1919, Mr. Thos. Mayhew, who had been secretary pro tem. for the Board for the preceding three months, was appointed the secretary of the Reclamation Board.

The Governor on November 6, 1919, appointed Mr. G. C. Shannon of Tudor, Sutter County, California, a member of the Reclamation Board in place of Mr. W. T. Ellis whose membership upon the Board had terminated on October 23, 1919. Mr. Shannon assumed his duties as a member of the Board at its meeting held on November 7, 1919.

MEETINGS OF THE RECLAMATION BOARD.

During the biennial period ending December 31, 1920, the Reclamation Board held fifty-six meetings in its office in Sacramento, with an average attendance of five members.

APPLICATIONS HEARD BY THE RECLAMATION BOARD.

During the calendar years 1919 and 1920 the Reclamation Board heard and considered sixty-two applications for reclamation, drainage and flood control works. Three of these applications were for the construction of bridges across rivers and by-passes, ten requested permission to build pumping plants, pipes, etc., through and upon river levees for irrigation and drainage purposes, four had to do with miscellaneous structures which in some way affect flood control channels or levees, and the remaining forty-five applications were for the reclamation of lands by means of the construction of levees, drainage systems, etc.

Of the above sixty-two applications three were withdrawn by the applicants after discussion and consideration before the Board, and the balance were passed upon by the Reclamation Board which issued regular official orders and requirements regarding the same. All of these discussions and orders appear in the minutes of the Board and copies of official orders were always sent to the applicants for their guidance.

The Reclamation Board has consistently followed its rule of advertising notices of all hearings at which applications were to be considered, so that an opportunity has been given for all interested parties to appear and give the Board the benefit of their ideas and arguments whether favorable or otherwise. The Board has also continued its rule of securing written recommendations from the engineering departments of the California Debris Commission, the State Department of Engineering, and the Reclamation Board, before passing on applications.

The list given below is the record of applications which have been considered or acted upon by the Reclamation Board since January 1, 1919.

Applica- tion number	Name of district	Number of district	Date of order
115	Conaway Ranch	2035	January 3, 1919.
116	Reclamation District 551	551	Application withdrawn.
117	S. Sweet Company		January 21, 1919.
118	Head Reach Gun Club		January 21, 1919.
119	Reclamation District No. 2020	2020	February 18, 1919.
120	Phelan-Parrott		March 18, 1919.
121	Prospect Island	1637	April 22, 1919.
122	(By-pass change.)	1630	April 8, 1919.
123	McCormack-Williamson District		March 18, 1919.
124	Rindge Land and Navigation Company		May 20, 1919.
125	McCormack-Williamson District		May 28, 1919.
126	Liberty Farms		August 4, 1919.
127	N. Fay and Son		August 4, 1919.
128	Conaway Ranch	2035	August 11, 1919.
129	Bishop Tract	2042	August 4, 1919.
130	Palm Tract	2036	August 4, 1919.
131	Rindge Tract	2037	August 4, 1919.
132	Upper Jones Tract	2039	August 4, 1919.
133	Lower Jones Tract	2038	August 4, 1919.
134	Victoria Island	2040	August 4, 1919.
135	Medford Island	2041	August 4, 1919.
136	(Changed to 1027.)		
137	Reclamation District No. 1500	1500	September 16, 1919.
138	George Swanston Application		October 23, 1919.
139	Levee District No. 1		September 30, 1919.
140	King Island	2044	November 18, 1919.
141	Sherman Island	341	November 7, 1919.
142	T. B. Edson		January 24, 1920.
143	Reclamation District No. 785	785	October 22, 1920.
144	Byrne Application	744	January 24, 1920.
145	Thos. Caswell		Application withdrawn.
146	East Side Canal Irrigation		January 9, 1920.
147	Head Reach Tract		March 27, 1920.
148	Chowchilla Ranch	1664	May 18, 1920.
149	Reclamation District No. 2034	2034	February 24, 1920.
150	Reclamation District No. 784	784	January 31, 1920.
151	Reclamation District No. 1660	1660	January 31, 1920.
152	Central Farms		January 9, 1920.
153	Mildred Island	2021	February 24, 1920.
154	Liberty Farms		April 23, 1920.
155	Reclamation District No. 17	17	February 24, 1920.
156	Conaway Ranch Company	2035	April 24, 1920.
157	Reclamation District No. 537	537	October 22, 1920.
158	Reclamation District No. 2047	2047	Application withdrawn.
159	Geo. P. Ahlf		July 8, 1920.
160	Reclamation District No. 2047	2047	July 8, 1920.
161	Reclamation District No. 830	830	August 25, 1920.
162	Conaway Ranch Company	2035	October 30, 1920.
163	Pacific Gas and Electric Company		October 30, 1920.
164	Sacramento River West Side Levee District		September 16, 1920.
165	Reclamation District No. 108	108	October 22, 1920.
166	B. C. French		October 22, 1920.
167	B. R. Harwood		September 17, 1920.
168	Reclamation District No. 1004	1004	October 22, 1920.
169	Great Western Power Company		October 22, 1920.
170	Feather River Irrigation District		November 29, 1920.
171	Trabern Ranch		October 30, 1920.
172	Tisdale Irrigation and Drainage District		December 29, 1920.
173	Sutter-Butte Canal Company		December 29, 1920.
174	Henry Hartman		December 29, 1920.
1027	Mawson Bridge—near Sutter-Buttes		September 11, 1919.
1028	Sacramento River Bridge at Grimes		November 29, 1920.
1029	Western Pacific Bridge, Marysville		November 29, 1920.

PROJECTS AND ASSESSMENTS.

The Reclamation Board has, during its fifty-six meetings of the last biennial, given a considerable amount of discussion, study, thought and action to the various requirements of its projects and assessments 2 to 7, inclusive. This is fully reflected by the minutes of the Board, which minutes cover pages 1739 to 2469, inclusive, of the official minutes of the Reclamation Board.

CONTRACTS AND LEASES.

During the last two years the Reclamation Board has let about eight contracts and subcontracts on projects 3, 6, and 7, which have totaled approximately three and one-half million dollars.

Several leases have been entered into by the Reclamation Board covering lands, which the Sacramento and San Joaquin Drainage District found it necessary to purchase in fee, in areas devoted to by-pass purposes, particularly in the Sutter, Yolo and Sacramento by-passes.

STUDIES AND INVESTIGATIONS.

Among other things, the discussions and questions brought up before the Reclamation Board required considerable study into various conditions throughout the Sacramento and San Joaquin valleys, which had to do particularly with drainage systems, low water conditions of the rivers, flood conditions, operation of permanent flood control structures, effect of river cut-offs, river bank erosion, hydrographic data, levee standards, summer and winter floods in the San Joaquin Valley, etc.

CHAPTER III.

**WORK OF CALIFORNIA DEBRIS COMMISSION DURING
PAST TWO YEARS.**

During the past two years most of the flood control work of the California Debris Commission has been confined to the enlargement of the lower Sacramento River between Rio Vista and Collinsville. During this period there has been extensive dredge work performed by both hydraulic and clamshell dredges although all of the dredges have not worked all of the time.

The hydraulic dredges used during the past two years consist of the two large plants belonging to the federal government, namely the "Sacramento" and "San Joaquin" and also the suction dredge belonging to the San Francisco Bridge Company. During parts of the time as many as three large long-boom clamshell dredges have been used for constructing the retaining levee work near the river. During the two-year period ending June 30, 1920, approximately thirteen and one-quarter million cubic yards of material were handled by the above dredges.

The material excavated from the Sacramento River channel is being spread out in the form of spoil banks over properties purchased on Brannan, Sherman and Dos Rios islands, as well as the low lands and gulleys along the base of the Montezuma hills. These lands used for receiving waste material are being purchased by the Reclamation Board under its Assessment No. 2, which is given more fully in chapter IV of this report. The cost of the construction work of this particular project is being borne equally by the federal and state governments, while the landowners over some four or five hundred thousand acres are being assessed for the necessary rights of way for channel way and spoil areas.

In addition to this work on the lower river, the California Debris Commission has completed, during the past biennial period, the Sacramento River cut-off between Wild Irishman Bend and Kinney's Bend, located about four miles southeast of Knights Landing and about three miles southwest of the mouth of the Feather River. This cut-off is about one-half mile in length and cuts off about three miles of the former river channel which was very winding. The easterly end of this cut-off is in the vicinity of the westerly end of Fremont Weir.

The California Debris Commission has made some surveys and test borings in connection with the Fremont Weir for the purpose of determining the best location and form of construction for the permanent weir, the studies for which are now being made by the Commission's engineers. The cost of weir construction and river cut-offs is borne by the federal and state governments, as in the case with the lower Sacramento River work described above.

The United States government requires that all moneys appropriated by it for flood control work shall be expended under the direction of its agents, hence the work of opening up the lower Sacramento River

and of constructing weirs and cut-offs is under the direct supervision of the California Debris Commission which is composed of three officers of the Corps of Engineers, U. S. Army, with offices in San Francisco.

Since the publication of the fourth biennial report of the Reclamation Board two years ago the state legislature of 1919 appropriated five hundred thousand dollars for this work for the biennial period ending July, 1921, and the federal government met this appropriation by an equal amount, thus giving to the California Debris Commission one million dollars in addition to the former appropriations, and also in addition to the balance still on hand.

CHAPTER IV.

**PROGRESS OF VARIOUS PROJECTS AND ASSESSMENTS OF
THE SACRAMENTO AND SAN JOAQUIN DRAINAGE
DISTRICT DURING THE CALENDAR YEARS 1919 AND
1920.**

In addition to its police power duties as described in chapter II, the Reclamation Board has had direct charge of a considerable amount of construction work during the past two years. A total of seven assessments have been levied by the Reclamation Board to date, but only five of these assessments are for construction projects.

Assessments 1 and 2 do not entail any construction work so far as the Reclamation Board is concerned, Assessment No. 1 having been levied for administrative expenses of the Reclamation Board, while Assessment No. 2 provides only for the purchase of land and rights of way needed by the California Debris Commission for channel way and spoil bank area in connection with the enlargement of the lower fifteen miles of the Sacramento River.

During the past two years the heavy part of the construction work of Sacramento By-pass Project No. 3, located in Yolo County about four miles northwest of the city of Sacramento, has been completed by the Reclamation Board. During this same period a little construction work was performed upon the Fremont Weir Project No. 4, this work consisting only of the clearing of brush.

The Freeport Levee Project No. 5 was completed prior to 1919 and no actual physical construction has been performed upon it during the last two years, however some financial work has been required for the collection of unpaid assessments and the redemption of outstanding warrants.

The major portion of the construction work handled by the Reclamation Board during the past two years has been in connection with the construction of the east levee of the Sutter By-pass in Sutter County under project known as the Sutter-Butte By-pass Project No. 6. During the same period a levee enlargement along the Feather River in Sutter County has been commenced under the Feather River Project No. 7.

For the calendar years 1919 and 1920 the Reclamation Board has issued claims for approximately four million six hundred thousand dollars covering expenditures for construction work, purchases of rights of way, and all expenses incidental thereto, including administrative, engineering and assessing costs.

For the purpose of giving a brief resume of the work accomplished upon the above projects during the past biennial period, each project or assessment is taken up herewith below in the order of its number:

GENERAL ADMINISTRATIVE ASSESSMENT NO. 1.

General Administrative Assessment No. 1 for \$250,000 was levied in June, 1914, against the entire acreage of the Sacramento and San Joaquin Drainage District for the purpose of financing administrative

and engineering expenses of the Reclamation Board for a term of years, and for the purpose of returning to the state treasury fifty thousand dollars of a former appropriation. This assessment was called in two installments, sixty per cent in June, 1915, and forty per cent in October, 1917.

During the past biennial period about sixteen thousand dollars of the principal and interest of the above assessment has been collected, but the books of the Reclamation Board show that there is still uncollected upon this assessment about fifty thousand dollars principal, upon which the accumulated interest amounts to about fifteen thousand dollars additional.

Most of the amounts still uncollected are withheld pending the final decision of the test suit which was brought several years ago by large San Joaquin Valley interests which objected to being included in an assessment for a flood control scheme. About three hundred suits were filed against this assessment, most of them having been filed in Glenn and Colusa counties. The largest amount involved in a single suit was brought in Merced County and the other suits were held open by stipulation and agreement awaiting the outcome of the test suit.

The decision of the Superior Court in Merced County upheld the validity of the Reclamation Board Act and of the administrative assessment, and the State Supreme Court upheld the opinion of the Superior Court. The matter has been taken to the United States Supreme Court before which it is assumed that a hearing will soon be held.

SACRAMENTO RIVER OUTLET ASSESSMENT NO. 2.

The Sacramento River Outlet Assessment No. 2 was levied in December, 1918, for \$1,500,000, and contemplates only the purchase of lands needed by the federal engineers for channel way and spoil bank areas in connection with the enlargement of the lower fifteen miles of the Sacramento River from Rio Vista to Collinsville.

The construction cost of the enlargement of the river is estimated at approximately twelve million dollars, which amount is being appropriated equally by the state and federal governments. Up to the present time almost four million dollars have been appropriated by the two governments and expended under the direction of the California Debris Commission.

The Reclamation Board has, during the past two years, purchased approximately three thousand acres of land under Assessment No. 2, which is about one-half of the total acreage needed by the government. These purchases have been made upon the islands known as Dos Rios, Sherman and Brannan islands on the east side of the river and includes the lands below elevation 35 along the base of the Montezuma Hills on the west side of the river.

All lands purchased by the Reclamation Board under Assessment No. 2 have been paid for in warrants which total approximately four hundred thousand dollars at the present time. The banks of Sacramento City have purchased about fifty thousand dollars worth of warrants against this assessment for the purpose of permitting the Reclamation Board to meet certain right of way, engineering and

property purchase expenditures which demanded cash instead of warrants.

The assessors held their hearings in connection with the limits of the lands to be included within the assessment in October, 1919. The outer boundaries of the lands which are to be benefited by the opening of the lower river include most of the lands within the Sacramento and San Joaquin Drainage District from the city of Sacramento to a point just north of the town of Tracy.

The legislature of 1919 appropriated \$500,000 as its share of the construction work to be handled under the direction of the California Debris Commission for the biennial period beginning July, 1919, and the United States Congress met this with an equal appropriation, so that the federal engineers have had at their command at least one million dollars for this work during the past two years.

SACRAMENTO BY-PASS PROJECT AND ASSESSMENT NO. 3.

The Sacramento By-pass Assessment No. 3, amounting to \$1,095,000, was levied in February, 1916. Prior to 1919 the weir and superstructure, a large portion of the clamshell dredge levees, and also a considerable portion of the suction dredge levees had been completed. During the biennial period covered by this report almost the entire work of this project has been fully completed.

Early in 1919 the suction dredge finished constructing those portions of the by-pass levees which were within two thousand feet of the Sacramento River. During the fall of 1919 the clamshell dredge "Jupiter" which had been upon this work for some years completed the construction of the balance of the by-pass levees as well as the razing of the cross levees.

In order to prevent erosion of the sand levees, which had been built by means of suction dredge pumping sand from the Sacramento River channel, it was decided to protect them with a concrete revetment which consisted of concrete facing reinforced with heavy wire netting which connected directly with a concrete curtain wall at the base of the levee, and at most dangerous portions this was protected with wide aprons of concrete blocks which were held together by cable, but were so constructed and laid as to be pliable in case of undermining. This was performed by the contracting firm of Cotton-Macauley Company, which began its work in the fall of 1919 and completed it in the early part of 1920.

There is still some road work to be performed upon the tops of the levees in order to comply with certain agreements entered into several years ago, and this work will probably be undertaken during the coming summer when hauling facilities will permit.

The Sacramento Weir and By-pass are now available for use as a relief to the Sacramento River during the coming winter providing high water should necessitate such use. The old river levee in front of the weir has not yet been removed, but the California Debris Commission, under whose jurisdiction the removal of this levee comes, is in a position to immediately open the levee in front of the weir in case of high water.

Movable hoisting machinery is being installed for the purpose of replacing beams and needles during the coming winter provided a large flood should necessitate the tripping of the wooden or movable portion of the weir. The Reclamation Board has had under consideration the turning over to the State Department of Engineering in the future of the operation of this weir during high water periods, together with the operation and maintenance of other flood control works. During the coming winter, however, the Reclamation Board forces will handle this particular matter.

The lands within the Sacramento By-pass were formerly portions of reclamation districts and are highly productive, hence the Reclamation Board has had no difficulty in leasing these lands for agricultural purposes; the tenants of course have to take all risk of flood damage in the winter time.

During the last two years about \$28,000 principal and interest have been collected on Assessment No. 3 and there is still outstanding about one-half of that amount which has not been collected. There are sufficient funds on hand for the road work and weir operation contemplated.

FREMONT WEIR PROJECT AND ASSESSMENT NO. 4.

Fremont Weir Assessment No. 4, amounting to \$219,000 was adopted and levied by the Reclamation Board in May, 1916, but was not collected until 1919. At the present time practically all of this assessment, including accrued interest and penalties, has been fully collected.

This project was adopted for the purpose of purchasing about 2300 acres of land in the upper Yolo By-pass, and of clearing that portion which was heavily covered with brush and timber. The lands so purchased include the site of the proposed Fremont Weir and the by-pass area immediately south of the same.

Over \$200,000 have so far been expended upon this project. Of this amount approximately three-quarters was expended for lands and about one-seventh for clearing. The balance of the expenditure included legal, engineering and assessment costs, together with interest upon outstanding warrants.

The clearing at this point was made for the purpose of relieving the choke which was caused by the dense growth of trees and underbrush. This choke was a menace to the levees recently built along the Feather River and the Sutter By-pass, as the Fremont Weir site is located just south of the mouths of the Sutter By-pass and the Feather River.

The California Debris Commission has been making surveys and test borings in this locality during the past few months for the purpose of making studies and preparing plans for the Fremont Weir, which is to be a concrete structure approximately one mile and one-half in length.

The Reclamation Board has leased for agricultural and grazing purposes the lands purchased under Assessment No. 4 and it is probable that these lands can be continuously leased for these purposes due to the fact that they are under water for only a very short portion of the year.

FREEPORT LEVEE PROJECT AND ASSESSMENT NO. 5.

The Freeport Levee Assessment No. 5 was levied in January, 1916, and amounted to approximately \$58,000. The project consisted of concrete revetment on the face of the levee along the left bank of the Sacramento River just below Freeport, Sacramento County, at a point where the bends of the river were such that erosion was cutting away the bank of the levee.

The physical work was completed prior to 1919 but the collections on the assessment had not been completed at that time because of a pending suit of some of the landowners who had objected to being included within the benefited area. In July, 1919, the Superior Court in Sacramento County rendered its opinion in favor of the Sacramento and San Joaquin Drainage District and the contesting interests not only made no appeal from this judgment but immediately paid their assessments in full.

During the last two years about nine thousand dollars principal has been collected on this assessment and the assessment has been fully paid. The total cost of the work performed, together with incidental and legal expenses, however, amounted to about one thousand dollars more than the amounts collected, hence there is at the present time a deficiency in the form of an outstanding warrant for the amount. It is hoped, however, that this matter can be satisfactorily handled as a part of a future estimate in connection with some project which will have to do with the completion of the Sacramento River levee in this general vicinity.

SUTTER-BUTTE BY-PASS PROJECT AND ASSESSMENT NO. 6.

The Sutter-Butte By-pass Project No. 6 was adopted in November, 1917, and the assessment then levied by the Reclamation Board amounted to approximately fifteen million dollars. In December, 1918, this assessment was revised, amended and reduced to approximately \$10,600,000, the principal amount of reduction being due to the elimination from the plans and estimate of the levees originally proposed for Butte Basin.

In August, 1919, the assessment was again amended for the purpose of including drainage canals and pumping plants, which matter had been placed within the powers of the Reclamation Board by legislative enactment by the legislature of 1919, the assessment then amounting to approximately twelve million dollars.

A third and final revision and reduction was decided upon in September, 1920, in order to conform with existing economic and construction conditions, and the assessment as finally levied amounts to approximately \$8,155,000, which assessment has been fully apportioned and distributed by the three assessors.

The distribution of the assessment was completed in December, 1920, and the assessment rolls were then filed with the county treasurers of the seven counties affected, namely, Butte, Glenn, Colusa, Sutter, Yuba, Yolo and Sacramento. It is hoped that the Reclamation Board, sitting as a board of equalization, will hold its hearings in the seven counties above mentioned during the month of January, 1921.

FINANCING WARRANTS.

One of the most difficult problems which the Reclamation Board has had to solve has been the handling of this construction work based upon payments with state warrants, which can not be redeemed by the State Treasurer until the assessment shall have been collected, either by direct call or through the sale of bonds.

Prior to 1919 the Reclamation Board was able to carry on this work by virtue of an agreement entered into with the Sutter Basin Company, a large landholder within Reclamation District 1500, whereby that company purchased at par upon presentation almost one million dollars worth of warrants against Assessment No. 6. This matter is set forth clearly in the fourth biennial report of the Reclamation Board issued December, 1918.

After January 1, 1919, the Sutter Basin Company was unable to further accommodate the Reclamation Board in this matter, hence it was necessary for the Board to find other means of financing. This was accomplished in a comparatively small way by means of an emergency bill presented to and passed by the legislature in January, 1919, and immediately signed by the Governor, which authorized the State Board of Control to invest its available surplus funds in state warrants issued against Sutter-Butte By-pass Project No. 6 to the extent of \$300,000.

By means of an arrangement with the State Board of Control for the immediate purchase of warrants, the construction work on Project No. 6 was continued by the Reclamation Board without stop throughout the winter, spring and summer of 1919, by which time it was necessary to finance in a large way in order to continue and complete the work.

After considerable effort (and in spite of many setbacks) on the part of the executive and legal officers of the Reclamation Board, continuing during a period of about four months, the Board was finally able to enter into a contract with W. P. Dwyer for the construction of the remaining work to be performed by the Board upon the Sutter By-pass Project up to a total expenditure of three million dollars in warrants.

It was realized that the terms of the Dwyer contract were somewhat in excess of those which a cash payment contract would have contained, because the contractor must carry warrants for a considerable length of time before they can be redeemed, but the landowners of the district affected were called into conference with the Reclamation Board and they not only heartily approved the terms of the Dwyer contract (which is given in full in the appendix of this report), but they urged the Reclamation Board to execute and place it into operation immediately for the earliest possible protection of the lands east of the Sutter By-pass, which were endangered at high water on account of the recent construction of the levees of Reclamation District No. 1500.

By means of the work accomplished under the Dwyer contract the Reclamation Board succeeded in saving the lands east of the by-pass from being flooded, which fortunately prevented a loss of several hundred thousand dollars to the producing landowners east of the by-pass. This contract is still in operation and it is hoped that work under the same can be completed during the coming calendar year.

CONSTRUCTION WORK.

The construction work performed upon Project No. 6 by the Reclamation Board during the last biennial period consists particularly in the purchase and condemnation of by-pass lands and levee rights of way north of Tisdale By-pass; the clearing of by-pass lands near the northerly end of the Sutter By-pass; and the construction of the east levee of the Sutter By-pass, of the Wadsworth Canal, of the Intercepting Canal, of drainage canals, seepage ditches, bridges, culverts, etc.

RIGHTS OF WAY AND CLEARING.

The Reclamation Board found it advisable to purchase in fee the lands in the upper part of the Sutter By-pass, due to the fact that the flowage rights, plus the estimated damages in this particular section, was about equal to the price asked for the fee. The wisdom of this course has been shown, for these lands have already been leased by the Reclamation Board to advantage for the growing of beans and other crops.

In many instances it was impossible to purchase the levee and canal rights of way at figures considered reasonable by the Reclamation Board, hence it was necessary to file a large number of condemnation suits, particularly for the Wadsworth and Intercepting canals. Many of these suits have already been brought to trial or settled, while other suits are still pending in the Sutter County court. The settlement of these right of way matters has necessitated frequent moving of buildings, structures and fences, as well as the cutting down of trees, etc.

The principal clearing which was performed during the past two years consisted in the clearing of the dense growth of willows and brush on what is known as the Stohlmann Ridge in the upper Sutter By-pass, together with some clearing of second growth in the lower stretches of the Sutter By-pass below Chandler station.

LEVEES.

Levee construction on the east levee of the Sutter By-pass has been pressed during the past two years for the purpose of preventing the lands east of the by-pass from being inundated during the present winter. By the end of 1920 a continuous levee had been constructed from Nelson Bend to the Sutter Buttes, a distance of twenty-two miles, and while this levee is not fully completed in some of its portions, yet it is sufficiently high to withstand a moderate winter.

During the past two years a comparatively large fleet of dredges has been at work upon this levee, reaching at times as high as six large clamshell dredges and three long-boom dragline excavators. By November, 1920, the excavators had completed their work and four of the floating dredges had been returned to the river. There are now two clamshell dredges at work on the east levee of the Sutter By-pass, and it is anticipated that they will have completed the levee by the summer of 1921.

The east levee of the Sutter By-pass is a comparatively large levee, having a height of about twenty feet, a crown width of twenty feet and a base of about one hundred twenty feet. No extraordinary conditions

arose in connection with this levee construction except at the point of its intersection with Gilsizer Slough, west of the town of Tudor, at which point it was necessary to strengthen the core of the levee with piling reinforcement. This was necessary because the foundation of the levee was upon rather soft low ground and the material for the construction of the levee had to be handled two, and sometimes three, times before it reached its final location, which left it in an unstable condition until it had fully dried out. The levee at this point at the present time has thoroughly dried out and settled and is as solid as any other portion of the system.

DRAINAGE.

The drainage system consists of large canals and diverting embankments which carry drainage water from the north directly into the Sutter By-pass by gravity, and also of smaller collecting canals and seepage ditches east of the by-pass which collect the waters and convey them to the pumping stations.

Of the first system the principal units are the Wadsworth Canal, about four miles in length—the waste material from which is piled in the form of levees on each side of the canal, these levees being from twelve to sixteen feet in height—and the Intercepting Canal, which has been constructed for a portion of the distance between Sutter City and Yuba City for the purpose of collecting waters from the north and diverting them through the Wadsworth Canal into the by-pass. The waste material from this canal has been placed in the form of a levee on the south side of the canal, which assists in collecting all waters which come from the north.

The other drainage system which transmits water to the pumping plants consists of seepage ditches which have been dug along the land side of all levees, and of large canals built approximately parallel with the by-pass levee for the purpose of intercepting all run-off water from the territory east of the by-pass, including such seepage water as may reach this territory from the Feather River.

These main drainage canals were not placed immediately adjacent to the levee because their excavation would have intercepted sand strata and pockets which would have encouraged a large amount of seepage under the levees by connecting the dredge borrow pits on the outside of the levees with the canals on the inside of the levees through the sand strata.

An economic alignment and elevation was found for these canals by following the borrow pits of old levees which were built in this particular territory many years ago, and which followed the general direction of the east levee of the Sutter By-pass, and are located within from one-quarter to a mile of the by-pass levee. By utilizing these old borrow pits the Reclamation Board obviated the necessity of purchasing good producing land for canal purposes.

On account of the several controversies which covered a period of years regarding the drainage of the territory east of the Sutter By-pass, the Reclamation Board in February, 1920, appointed a board of three consulting engineers, consisting of Mr. F. C. Herrmann, Mr. B. A. Etcheverry and Mr. M. Enderlein, to investigate and recommend to the Board a plan for the drainage system. A few weeks later the board of

consulting engineers approved and recommended the plan which the engineering department of the Reclamation Board had already proposed, hence the plan was immediately adopted by the Reclamation Board.

PUMPING PLANTS.

The above board of consulting engineers engaged, with the permission of the Reclamation Board, Mr. T. W. Ransom, a mechanical engineer, to design the pumping equipment which would care for the drainage system as recommended by the engineers and adopted by the Reclamation Board. Mr. Ransom's plans were soon adopted so that the discharge culverts through the levees could be completed prior to the present winter. These discharge culverts are constructed of reinforced concrete and are so located that they can be used for gravity drains for the district to the east whenever the water in the by-pass is low enough for the water to drain through the levees by gravity. These same culverts will be used for the discharge from the proposed pumps at times of high water in the by-pass.

These culverts through the levees were completed during 1920, and they were closed with gates and temporary sack dams so that possible high water during the present winter can not flow back into the territory east of the by-pass.

No work has yet been performed upon the construction of the pump foundations, the pump buildings, or the purchase and installation of pump equipment. It is expected that this will be done during the calendar year 1921.

BRIDGES.

Two wooden bridges have been constructed across the borrow pit of the east levee of the Sutter By-pass, and these bridges have been provided with movable spans which will permit dredges to pass through them for the purpose of reaching any portion of the levee in the future. These spans are so arranged that they can be removed by the dredge before passing through.

All of the bridges across the Wadsworth Canal have been located in line with existing county roads, and the Reclamation Board has constructed these bridges of reinforced concrete so that they will be permanent structures and will be taken over and maintained by the supervisors of Sutter County.

A concrete bridge has also been constructed across the Wadsworth Canal where the same passes beneath the electric railroad which operates between Marysville and Colusa.

The bridges which have been built across the Intercepting Canal are of reinforced concrete where they are located in line with county roads, and are wooden structures where they are located so as to connect private properties.

All of the bridges which have so far been constructed across the main drainage canal are wooden structures, but it is anticipated that during the coming year there will be two or three concrete bridges built in line with county roads.

CONSTRUCTION COSTS.

During the years 1919 and 1920 the Reclamation Board has issued warrants for about \$2,700,000 for construction work, and also warrants for about \$350,000 for rights of way on this Project No. 6.

FEATHER RIVER PROJECT AND ASSESSMENT NO. 7.

In October, 1919, the Reclamation Board adopted Project No. 7, covering the enlargement and completion of the Feather River levee opposite Reclamation Districts 803 and 823, which are across the river from the town of Nicolaus. This is the only portion of the west levee of the Feather River south of Yuba City which is to any very great extent below grade and insufficient for ordinary flood control purposes.

The assessment amounts to about \$370,800, and the same three assessors were appointed who have handled the other assessments of the Reclamation Board during the past few years, namely Messrs. Herrmann, Etheverry and Enderlein.

During 1919 a contract was entered into with Mr. J. C. Boyd whereby a small amount of the levee work was performed with teams, the levee being raised a few feet but not widened particularly.

In the summer of 1920 a contract was entered into with W. P. Dwyer for the handling of the balance of this work, this contract being quite similar in its terms to the contract entered into a year previous with W. P. Dwyer for the handling of the work on the Sutter By-pass. A copy of this contract is given in full in the appendix.

Under the Dwyer contract a brush-clearing outfit was placed upon this work during the latter part of the summer of 1920 and has continued to date clearing out the dense brush on the river side of the present levee so that floating dredges can be brought into this work during the coming winter.

It is anticipated that at least one dredge will have to remain upon this work from the coming winter to the next winter, at which time it should be through with its work and able to get back to the Sacramento River during the comparatively high stages of the Feather River. During the spring, summer and fall months the water in the Feather River is not deep enough for the floating of a dredge, hence dredge transportation, other than in winter time, is either impossible or very expensive.

Up to date the expenditures made by the Reclamation Board in warrants against Assessment No. 7 amount to about \$75,000, almost all of which are for the construction work.

This project includes a cut-off through a sharp bend in the present levee system opposite the town of Nicolaus and is made at the urgent recommendation of the California Debris Commission for the purpose of insuring sufficient channel way for flood waters in the Feather River opposite Nicolaus.

CHAPTER V.

**WORK PERFORMED BY RECLAMATION DISTRICTS AND
PRIVATE INTERESTS DURING 1919 AND 1920.**

During the past two years there has not been a large amount of new reclamation work undertaken by private interests, although there has been a considerable amount of reclamation work accomplished through the enlargement and completion of levee systems and the development of drainage systems.

The extensive rice development in the Sacramento Valley in the vicinity of the Sutter Buttes has necessitated the development of rather large drainage systems for the territory north and west of the Sutter Buttes in Butte and Colusa counties, and particularly in the formation of a very large drainage district known as Reclamation District No. 2047, which is designed to lead the drainage waters through the Colusa Basin or trough and deliver them into the Sacramento River.

A considerable amount of work is now under way in the construction of drainage canals under this recently formed district, and quite extensive works are planned for the future which will include the enlargement of river levees and the construction of permanent structures for drainage purposes through the levees.

The irrigation systems throughout the Sacramento Valley, not only for the recently developed rice fields but for other products, have made quite a demand upon the Sacramento River for water, and these matters have come before the Reclamation Board so far as the installation of pumping plants within the channel way and pipe lines through the levees are concerned.

The principal new reclamation work in the Sacramento Valley has been performed by Reclamation District 2035, known as the Conaway Ranch, which is located within and west of the Yolo By-pass in Yolo County, just east and southeast of the town of Woodland. The Conaway interests have constructed during the last two years several miles of the west levee of the Yolo By-pass extending from the electric railroad operating between Sacramento and Woodland, southerly to a point near the Southern Pacific Railroad connecting Sacramento and Davis.

The principal levee enlargement performed by private districts during the past two years in the upper part of the Sacramento Valley is confined practically to Reclamation Districts 70, 1500, 108, 730, 1001, 551 and 999.

A very large amount of reclamation work has been continued through the past two years in the delta region, particularly upon the islands about midway between the city of Stockton and the junction of the Sacramento and San Joaquin rivers at Collinsville. The islands upon which a large portion of the dredge work has been recently performed include the following islands: Mildred, Medford, Victoria, Palm, Bishop, McDonald, Bacon, Mandeville, Webb, Jones and Rindge.

In the San Joaquin Valley the principal reclamation work which has taken place during the past two years is the work commenced by the Trahern Ranch owners on the north bank of the Stanislaus and east

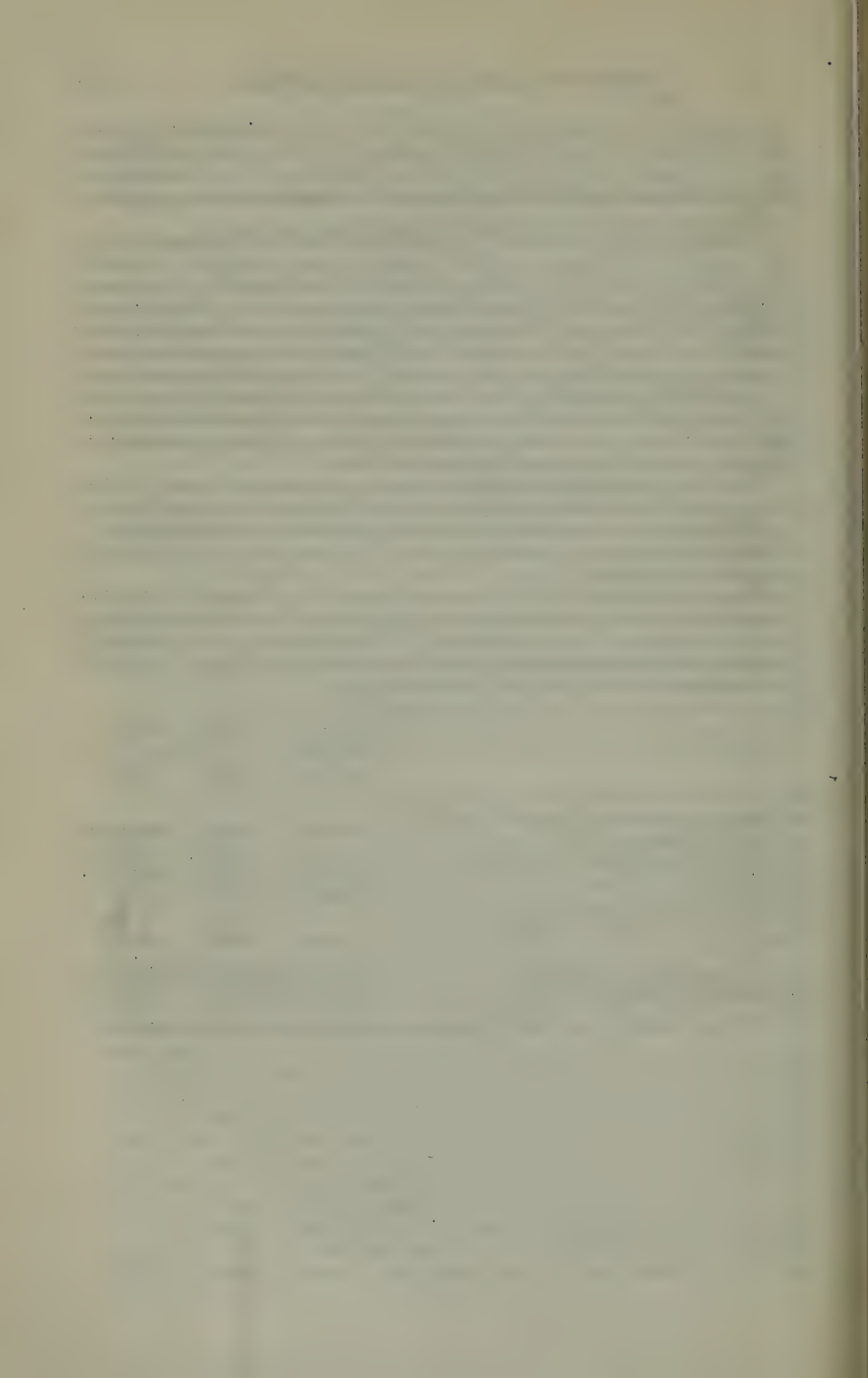
bank of the San Joaquin rivers. These owners are arranging to reclaim about 5000 acres of land under the name of the River Junction Farms and have begun their work under the direction of the Reclamation Board engineers pending the final fixing of flood planes in this particular locality.

During the past two years there has been some tidal reclamation in the lower Yolo By-pass, property owners being permitted to build temporary levees to an elevation of about two feet above the maximum high tide. In view of the fact that the west bank of the Yolo By-pass has not been constructed for many miles above this point and that the area to the west of the by-pass is to all intents and purposes used as a by-pass or storage basin area, the low tidal levees can not do any damage by appreciably raising the flood plane within the by-pass. Permits for this work, however, contain the provision that the Reclamation Board may order the levees removed at any time it may prove desirable for the flood control plan of the Sacramento Valley.

The table given herewith below shows an estimated record of the expenditures in the Sacramento Valley for flood control work, divided into three columns, that performed during the fiscal year ending July 1, 1920, the estimated expenditures since 1910 and the total estimated expenditures to date.

These expenditures include moneys expended by private individuals, corporations, reclamation districts, municipalities, and the Sacramento and San Joaquin Drainage District. It also includes, as a last item, moneys which have been appropriated by the State of California towards the Sacramento Valley Flood Control Project.

	Known expenditures July 1, 1919, to June 30, 1920	Estimated expenditures	
		Since July, 1910	Total to date
Enlargement Sacramento River channel (Rio Vista to Collinsville).....	\$395,741 53	\$807,616 63	\$807,616 63
Construction of weirs.....		158,327 20	220,402 90
Rectification and enlargement of river channels.....		23,731 80	23,731 80
Sacramento River levees.....	594,771 52	4,603,864 29	8,438,536 29
By-passes.....	2,204,109 61	7,228,329 33	7,879,571 33
Tributaries.....	181,736 53	1,983,321 53	4,294,562 53
Colusa Basin Drainage Canal (Knights Landing Ridge Cut).....		651,276 97	651,276 97
Bridges.....	7,530 09	268,848 51	268,848 51
Total expended by landowners.....	\$3,383,889 28	\$15,725,316 26	\$22,579,547 05
Appropriations by State of California.....	250,000 00	1,600,000 00	1,850,000 00
Appropriations by federal government.....	250,000 00	1,600,000 00	1,850,000 00
Total on Sacramento Valley Flood Control.....	\$3,883,889 28	\$18,925,316 26	\$26,279,547 05



APPENDIX.

CONTRACT WITH W. P. DWYER—SUTTER-BUTTE BY-PASS PROJECT No. 6.

Articles of Agreement, made and entered into in duplicate this first day of September, 1919, by and Between SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT, created by the "Reclamation Board Act" of the Legislature of the State of California, acting by and through the Reclamation Board, the party of the first part, and WILLIAM P. DWYER, of the city of Sacramento, county of Sacramento, State of California, the party of the second part.

RECITALS:

A. For the sake of brevity and convenience, the Sacramento and San Joaquin Drainage District will be hereinafter called the "District," the Reclamation Board will be hereinafter called the "Board," William P. Dwyer will be hereinafter called the "Contractor," and the general manager of the Board, or any engineer that may be specially designated in writing by the Board, will be hereinafter called the "Engineer."

B. The Board has heretofore adopted plans for the construction of certain works of reclamation as authorized by law, including the construction of the Sutter By-pass and all other work hereinafter mentioned. The Board has made said plans into a separate portion or project. The Board has entered in its minutes a resolution to the effect that the execution of said separate portion or project is a public necessity and has designated said portion or project by the name and number of Sutter-Butte By-pass Project No. 6. The Board has ordered an assessment of land within the District for the purpose of paying the cost of the works included within said Sutter-Butte By-pass Project No. 6, and incidental expenses as provided by law; said assessment being known and numbered as Sutter-Butte By-pass Assessment No. 6. The plans for said project have been amended by the Board on several occasions, the last amendment having been made by resolution of the Board, duly passed and adopted on the eleventh day of August, 1919, and the said resolution has been entered in the minutes of the Board. A copy of said plans and the Board's estimates of the cost of carrying out said plans is hereunto attached, marked "Exhibits 1 to 37, inclusive," and by this reference made a part of this agreement.

C. The Board has, by a resolution adopted on the eleventh day of August, 1919, and entered upon its minutes, appointed three assessors to assess upon the lands within the District proposed to be assessed for the said plans adopted by the Board, the sums included in the assessment of the said Board and to apportion same according to the benefits that will accrue to each tract of land in the District, respectively, affected by said particular portion or project by reason of the expenditure of said money.

D. The said assessors have not yet made a preliminary report to the Board indicating the exterior boundaries of the lands that in their opinion were benefited by the expenditures.

E. The Board has heretofore undertaken and is now prosecuting the work of constructing and completing, in accordance with said plans, parts of the East Levee of the Sutter By-pass and parts of both levees of Wadsworth Canal and other work included within said Sutter-Butte By-pass Project. The work hereinafter described has not yet been completed.

F. There are certain costs and expenses—as for procuring rights of way and engineering and assessment expenses—which will have to be paid by the Board in cash in order to complete the work hereby contemplated and to distribute and validate the said assessment, and the Board has not available sufficient funds with which to pay said amounts.

COVENANTS:

Now, Therefore, It Is Covenanted and Agreed:

WORK TO BE DONE.

1. The District hereby employs the Contractor to perform, and the Contractor agrees to perform, all of the work of construction and completion of the East Levee of the Sutter By-pass, and the East and West Levees of Wadsworth Slough Canal and the drainage east of Sutter By-pass, and comprising the following work:

The construction and completion up to final grade and cross section of the East Levee of the Sutter By-pass from its southerly terminus at Nelson's Slough to its northerly terminus at or near Long Bridge, connecting the Sutter Buttes with Reclamation District No. 70; the construction and completion to final grade and cross section of both levees of the Wadsworth Slough Canal throughout its entire length from the Sutter By-pass to the intercepting canal; the construction and completion to final grade and cross section of the intercepting canal, including the consequent levee throughout its entire length from the Sutter Buttes to the Feather River; the construction and completion of all drainage, seepage, collecting and other canals and ditches in connection with the above-mentioned levees or canals, all east of the Sutter By-pass, and included within the Sutter-Butte By-pass Project No. 6; the clearing of the Sutter By-pass of all existing timber, brush, all cross levees and other matter, as shall be required by the Board; the construction and installation of all pumping plants, pumping systems, culverts, discharge pipes, syphons and structures and devices included within the plans for said project in connection with the lands east of the Sutter By-pass, or as shall be required by the Board; transporting equipment, tools, material and supplies to and from the place of work; doing all pumping necessary for dredger flotation, and all blasting necessary for expeditious excavation; the construction of all bridges, fences, wagon roads, and incidental structures necessary for the completion of the East Levee of the Sutter By-pass, both levees of Wadsworth Slough Canal, intercepting canals, etc.; moving and setting up all structures made necessary by the right of way conditions; and all other work in connection with or incidental to the work above described which may be ordered by the Board; *saving and excepting, however*, the work of levee protection, the location and style of which can not be determined until after the levee system shall

have been completed and tested, and the levee protection work is therefore excluded from this contract. All of said work shall be done in accordance with the plans therefor duly adopted by the Board and attached hereto as exhibits, as hereinbefore recited.

CONTRACTOR'S PERCENTAGE.

2. The District agrees to pay the Contractor, and the Contractor agrees to accept from the District, as compensation for the performance of the said work, the base prices hereinafter set forth, plus seventeen and one-half per cent ($17\frac{1}{2}\%$) of such base prices.

PLANT TO BE FURNISHED BY CONTRACTOR.

Large Clamshell Dredger.

3. The Contractor agrees that on the due execution of this agreement he will furnish and operate four large clamshell dredgers of the following dimensions:

	Minimum length of boom, feet	Minimum capacity of bucket, cubic yards
1 dredger	165	4
1 dredger	175	4
1 dredger	190	4
1 dredger	200	4

The said four dredgers shall be kept on the work during the performance of this contract, and none of them shall be withdrawn or discharged from said work so long as it continues to perform satisfactorily or reasonably well the work which similar dredgers should perform under existing conditions, or until the Board shall order the work on which said dredgers shall be engaged to be done by dragline excavators or machinery different from clamshell dredgers.

Within fifteen days after receipt of notice and demand from the Board, or its Engineer, or other duly accredited representative, the Contractor shall furnish two additional dredgers of the following dimensions:

	Minimum length of boom, feet	Minimum capacity of bucket, cubic yards
1 dredger	170	4
1 dredger	200	4

SMALL DREDGERS OR DITCHERS.

4. The Contractor agrees to furnish, when and as required by the Board, on thirty days' notice as to each machine required, three small dredgers or ditchers of such styles and dimensions, and at such base prices as shall be agreed upon between the Board and the Contractor.

DRAGLINE EXCAVATOR.

5. In addition to the three dragline excavators furnished under this contract and now on or en route to the work, the Contractor will add one dragline excavator if required by the Board within thirty days after receipt of notice of such requirement. Such additional dragline excavator shall be of the following dimensions: Boom 100 feet in length, bucket at least 3 cubic yards' capacity; and said dragline excavator shall be satisfactory to the Engineer. The cost of transportation of this additional dragline excavator from whatever place it may be when required, to the place of work and out again to a point to which the transportation shall be of equal or less expense, shall be charged as part of the work.

BASE PRICES.

6. Large clamshell dredgers, including those to be used as provided in section 3 of this agreement and others that may be available from time to time as required, subject to limitations contained in section 7a.

Name of dredge	Minimum length of boom, feet	Minimum capacity of bucket, cubic yards	Base price per hour (a)
Neptune	225	6	\$13 08
Hereules	225	6	13 08
Mars	225	6	13 08
Trojan	200	5	11 02
Vulcan	200	4	10 50
Armour	200	4	10 50
Monterey	200	4	10 50
Gerber	190	4	10 25
Lisbon	175	4	9 50
Argyle	165	4	9 50
Jupiter	165	4	9 50
Gabiland	170	3	8 73
Thor	160	5	9 17
Atlas	160	4	8 96

(a) Base price (b) shall be three-fourths of base price (a).

(b) Base price (a) is the price per hour for all approved worktime of the dredgers respectively, and also for transportation time during which any dredge shall be digging its way with full head of steam for the purpose of assisting transportation.

(c) Base price (b) is the price per hour for shutdown or idle time on account of fog, lack of water for flotation, heavy wind, injunction or other court proceedings, or any other cause beyond the power of said District to control.

(d) Base price for small dredgers or ditchers shall be agreed upon in writing between the Contractor and the Board, or its duly accredited representative.

(e) Base price for work of dragline excavators shall be 23 cents a cubic yard, measured in excavation only.

(f) The base prices hereinbefore named for large clamshell dredgers, and work done with dragline excavators and ditchers or small dredgers, shall include the wages of the crew and the cost of fuel, supplies, repairs and replacements and all other expenses of operating the plant. Provided, however, that the said rates are based upon the present cost

of fuel oil and the present rate of wages for dredger operatives, as shown by the attached schedule marked "Exhibits 38 and 39;" and if the cost of labor and fuel, or either of them, should increase or decrease, the said base rates shall be increased or decreased accordingly.

(g) The base price for all work contemplated by this contract, other than those items for which the base price is herein otherwise established, shall be the actual cost, including the rental paid for, or the rental value of, all machinery, tools, tents, wagons, automobiles, trucks, teams and other equipment furnished by the Contractor, the cost of all repairs, including replacement of parts where necessary, the cost of labor, fuel and supplies of all kinds and all other costs of operation; and there shall also be included the cost of transportation of all materials and supplies to and from the place of work and the cost of workmen's compensation, fire and automobile insurance.

(h) As to any plant or equipment of any kind that shall be supplied by the Board and used by the Contractor, the base price shall be the amount necessarily paid for repairs, including the replacement of all parts where necessary, and the cost of labor, fuel and supplies and all other costs of transportation, installation and operation thereof.

(i) If it should be necessary to purchase machinery, tools, tents, wagons, trucks, automobiles, teams or other equipment, the base price shall be the actual cost thereof, together with transportation thereof to the place where required, and the amount necessarily paid for repairs, including the replacement of all parts when necessary, and the cost of labor, fuel and supplies and all other costs of transportation, installation and operation thereof. The articles so purchased shall belong to the District.

(j) All items of cost (other than those items for which the base prices are herein otherwise established) shall be reasonable cost, and in all cases no purchase or sub-contract shall be made or let by the Contractor when the purchase or the sub-contract exceeds the sum of \$2500, unless first submitted to the Board for approval; and the Board may, at its option, require the Contractor to receive bids on said proposed purchase or said proposed sub-contract, or the Board may itself advertise for bids in regard to said purchase or said sub-contract, and shall in all cases be the final arbiter as to what bids shall be accepted and to whom said purchase or sub-contract shall be awarded. All other costs incurred by the Contractor shall be submitted to the Board, or such representative as it may designate, in advance, and the Board, or such representative, shall act promptly upon all questions of cost submitted to it in advance, and shall hold harmless the Contractor from any loss caused by any delay in passing upon any such matters submitted to the Board.

(k) Provided that in case of emergency, to prevent loss or damage to the work under construction, the Contractor may incur costs necessary to meet the emergency, and in case of such emergency, his discretion as to such costs shall be final and conclusive.

ADDITIONAL DREDGERS AND MACHINERY.

7a. Whenever the Board shall require additional dredgers or other machinery to be placed upon the work, it shall give notice to the Contractor of the dredgers or other machinery required, either by dimension and capacity or by name, and the Contractor shall have thirty days after the receipt of such notice to furnish such additional dredger, or such other machinery, or its equal, for the particular work required. It is understood that the number of dredgers and other machinery accessible for this work is limited, and that it is not always possible to procure dredgers or other machinery when and as required; and the agreement of the Contractor to obtain additional dredgers or other machinery shall be limited to such machines as shall be available at the time when they shall be required.

7b. In case any dredger or other plant not on the ground at the time work under the contract begins shall be supplied by the Contractor, the cost of transportation of such dredger or other plant, from wherever it may be to the place it is required to go to work, shall be added to and become part of the base price.

WORKING CONDITIONS OF DREDGERS, DRAGLINE EXCAVATORS AND DITCHERS.

8a. Work by dredgers and other equipment must be done and material placed in accordance with the directions of the Engineer, provided that the Contractor shall not be required to place material beyond the reach of the boom of any dredger while afloat in the borrow pit or dredger cut, nor shall the Contractor be required to conform to the instructions of the Engineer to any greater degree of exactness than is possible by the skillful operation of the dredgers respectively.

8b. At all times the dredgers, ditchers and all plant and equipment herein mentioned, shall be under the direction and supervision of the Board, and the Contractor shall do no work except as directed by said Board or its representatives; provided that the Contractor shall be responsible for and have exclusive control over said dredgers and other machinery and equipment and their crews and the care and mechanical operation of said dredgers, and other plants. The Contractor agrees to keep said plant manned at all times, whenever the labor market shall permit, with first class, skilled, experienced operators, to maintain the machinery and equipment in first class condition, and to perform efficient work.

8c. The District agrees to furnish sufficient water for flotation of dredgers, and also sufficient water for flotation and transportation of fuel oil from Chandler Station, Sutter County, California, to the dredgers and other plant at work upon the levees. All work done by the Contractor in and about securing and maintaining flotation shall be paid for by the District.

8d. The buckets of all large clamshell dredgers, whenever so required by the Board, shall be furnished with teeth, at the expense of the Contractor.

8e. Clocks are to be installed by the District and kept on each dredger under the control of the Engineer, for the purpose of indicating

the record and handling of the dredger buckets by the levermen; and duplicate copies of all daily reports by the captain of each dredge are to be delivered daily to the Engineer.

8f. The Contractor agrees to furnish continuously, free of charge to the District, board and room on each large clamshell dredger for the inspector for the District; said room to contain a bed for the exclusive use of said inspector, and not to be used for the lodging of any of the crew of said dredge, except in case of temporary emergency.

8g. The District agrees that whenever it shall be necessary to move a dredger or other floating plant into or out of the navigable waters of the Sacramento River, the District shall provide, free of charge to the Contractor, a passage way into or out of said navigable waters of the Sacramento River, and the Contractor shall be entitled to full time for all plant that shall be held idle because such passage way shall not have been furnished, and the time consumed and expenses incurred in cutting into or out of said river shall be deemed part of the work of this contract.

8h. The location, height, slope and crown of the levees shall be designated by the Engineer in accordance with the plans. Before the beginning of work and during its progress the Engineer shall set stakes to indicate the height, slope and crown of said levees, such stakes at all times to cover at least one hundred feet ahead of each dredger or other equipment that shall be employed by the Contractor to do the work.

8i. It is the desire and intent of the parties that all dredgers shall be operated twenty-four hours each day, except for necessary shutdowns; but it is agreed that the working hours shall be governed by the ability of the Contractor to obtain competent operatives; that is to say, if the Contractor shall be able to supply three crews of competent men, the working day shall be twenty-four hours; if he is able to supply but two crews of competent men, the working day shall be sixteen hours; and if he is able to supply but one crew of competent men, the working day shall be eight hours. Each dredger shall be allowed fifteen minutes idle time during each six hours shift for oiling machinery and equipment, for which time no deduction shall be made from Rate (a).

HAULING FUEL OIL.

9. The Contractor agrees to haul fuel oil by launch and barge from Chandler Station on the Southern Pacific Railroad to the respective places where such fuel oil is required.

In case dams shall be necessary across borrow pits between Chandler Station and the respective dredgers at work, all costs of pumping and transporting fuel oil over one dam shall be borne by the Contractor, and the expense of pumping and transporting fuel oil over all additional dams across said borrow pits, shall be borne by the District. And in case it should be impossible for any reason to transport fuel oil from Chandler Station by launch and barge, the District agrees to pay to the Contractor the difference in cost of transporting such fuel oil by other means, over what it would cost if done by launch and barge. If the Engineer should require the Contractor to haul fuel oil from some point on the Northern Electric Railroad instead of from Chandler Station, the Contractor shall obey such requirements, and

in case the cost of hauling from the Northern Electric Railroad should be greater than hauling from Chandler Station by launch and barge, the increased cost shall be borne by the District.

**RIGHTS OF WAY—OBSTRUCTIONS—RESPONSIBILITY FOR
DOING WORK.**

10a. The District undertakes and agrees to secure all necessary rights of way for levees, drainage ditches and borrow pits and ditches, including the right to excavate and deposit material.

10b. The District assumes full responsibility for any obstructions to the operation or movement of the Contractor's dredgers or other plant while engaged in the work, or moving plant to or from the place of work, including trestles, bridges, levees, cuts, dams, and telephone and telegraph wires. The District shall bear all costs and expenses of removing any such obstructions and replacing the same where replacement shall be necessary; and the Contractor shall not be liable for any cost or expense on account of any such obstructions and shall be entitled to full time for plant or men held idle during any delay caused by any such obstructions. The cost of any work done and the amount of any outlays made by the Contractor in removing and replacing obstructions shall be included in the base price. Provided, however, that the Contractor shall be liable for all losses or damages caused by his negligence.

10c. The District assumes full responsibility for the performance of all work contemplated by this agreement, and undertakes and agrees to indemnify the Contractor and hold him harmless from any and all manner of loss, damage, cost or expense that shall arise out of the performance of the work hereby contemplated; and in the event of any interference with the Contractor in the performance of the work by injunction or otherwise (unless caused by the Contractor's negligence), the Contractor shall not be required to begin or continue said work, and shall not be liable for any cost or expense on account of such interference, and shall be entitled to full time and pay and percentage for plant and labor held idle during any delay caused by such interference, except that large clamshell dredgers shall be paid base price (b) and percentage. If such injunction or other interference shall not be released or withdrawn within thirty days after stoppage of work on account thereof, either party at its option may terminate this agreement. In case of termination of the contract by the District for any of the reasons stated in this paragraph, the District shall pay the Contractor for all expense, loss, cost and damages growing out of such premature termination.

10d. In case the work shall thereafter be resumed by the Board, then the Contractor shall have the right at his option to resume and complete the work under the same terms as in this agreement provided.

10e. The Contractor shall not be held liable for any loss, damages or delay caused by the breaking of a dam, or the destruction or impairment of any levee, ditch, dam or other part of the work, after its once having been constructed properly by the Contractor; it being the understanding and agreement that the Contractor, working under the orders and directions of the Board and its Engineer, assumes no

responsibility for the quality, stability or permanence of the work, and shall be responsible for its negligence only. In case of delay caused by the break of a dam, or any of the works, not due to the Contractor's negligence, the Contractor shall be allowed full time for all plant and labor held idle on that account.

ENGINEERS, ORDERS AND REPORTS.

11a. The Contractor agrees that at all times during the performance of this contract, his superintendent and such assistants and representatives as he may find necessary for the supervision of the work, shall be accessible to the District and its Engineer and assistants and inspectors, for the purpose of receiving orders and making reports. The names of such superintendent, representatives and assistants, together with a statement of their respective powers, shall be furnished to the District by the Contractor. Receipts in writing for written orders shall be given whenever required by the Board, or its Engineer, or other representatives of the District.

11b. The District agrees that at all times during the performance of this contract the Engineer, and such assistants and inspectors as it may find necessary for the supervision of the work, shall be accessible to the Contractor and his superintendent and assistants, for the purpose of giving orders. The names of such superintendent and his assistants and inspectors, together with a statement of their respective powers, shall be furnished to the Contractor by the Board. All orders given by the Board, or the Engineer, or other representatives of the District, shall be given in writing whenever required by the Contractor.

11c. A copy of the daily reports of the operation of the clamshell dredgers respectively, showing the time of running, the time of all stops and delays and the cause thereof, shall be furnished to the Engineer, and each of said reports shall be conclusive of the matters covered thereby, unless objection be made thereto within fifteen days after the service of such copy on the Engineer. In no event shall the Contractor be liable for any stops or delays, however caused, beyond the loss of compensation for such time.

11d. Obedience by the Contractor of the orders and directions of the Board, its Engineer and other duly accredited representatives, shall in all cases constitute a full compliance with this contract to the extent of the matter covered by such orders and directions.

LABOR TROUBLES.

12. This agreement shall be subject to strikes, lockouts or other labor disturbances, or the inability of the Contractor to obtain workmen. Whenever such strike, lockout or other disturbance shall occur, the Contractor shall submit to the Board, or to its duly accredited Engineer having power to act, the question whether the Contractor shall retain at the place of work any machinery, plant or appliance for which the Contractor is bound to pay a rental charge, or whether the Contractor shall return such machinery, plant or appliance to the owners thereof so as to stop the rental charge during the pendency of the strike. If the decision of the Board shall be favorable to retaining the rented articles, the rental charge thereof shall be charged to the District at

base price, plus Contractor's percentage, the same as if the work under this contract were being carried on.

PAYMENT TO CONTRACTOR—AUDIT OF ACCOUNTS.

13a. All sums that shall become due to the Contractor for the performance of this agreement, shall be paid to him in warrants of the District drawn upon Sutter-Butte By-pass Assessment No. 6, which warrants shall be promptly, properly and legally drawn, signed, registered and delivered to the Contractor. Warrants shall be made payable to the Contractor or his nominee, and shall be in such denominations (within the amount approved) as shall be requested by the Contractor.

13b. On or before the tenth day of each month, the Contractor shall render an account covering all work done during the preceding calendar month, and all sums due to the Contractor up to and including the last day of such preceding month.

13c. Such monthly accounts shall be audited by the Board and the Engineer, and all possible expedition shall be exercised in auditing such accounts and delivering legal warrants therefor to the Contractor. In case any one or more items of any monthly account shall be disputed by the Board and an adjustment can not be promptly made, the Board shall nevertheless approve and cause a warrant to be issued for such parts of the account as are not disputed, and such a portion of the amount of the disputed items as will leave a reasonable margin of safety; and all disputed items shall be taken up for audit and adjustment as soon as may be practicable.

TERMINATION OF CONTRACT.

14a. The parties hereto estimate that the base prices of the work covered by this agreement will be \$2,250,000. Since the base prices can not be made exact and the Contractor is unwilling definitely to undertake more work than can be done within the estimate aforesaid, it is agreed that this contract shall terminate;

(1) Whenever the work hereby contemplated shall have been completed;

(2) At the option of the Contractor, whenever the total base price shall have equaled the sum of \$2,250,000, whether the work shall have been completed or not.

14b. This agreement is entered into with the confident belief on the part of the parties hereto that the assessors will have completed their separate list of the lands assessed in each county and filed the same when completed with the Secretary of the Board, and that such filing will be done with all convenient dispatch; and it is agreed that if said lists shall not have been filed with the Secretary of the Board on the first day of May, 1920, the Contractor may give written notice to the Board to that effect and demand of the Board that the said lists be filed with said Secretary, and this agreement may be terminated, at the option of the Contractor, and without further notice to the Board, if the said completed lists shall not have been filed with the Secretary of the Board within thirty days after service of said demand and notice; such demand and notice may be served by personal delivery, or by mailing to the President or Secretary of the Board.

FURNISHING MONEY BY CONTRACTOR.

15. The Contractor further agrees that he will furnish in cash not to exceed the sum of \$250,000, for the purpose of paying the costs and expenses for procuring right of way, engineering and assessment expenses which will have to be paid by the Board in cash in order to complete the work hereby contemplated and the distribution and validation of said Sutter-Butte By-pass Assessment No. 6. All sums of money furnished by the Contractor under the provisions of this paragraph shall be evidenced by legal warrants drawn against the said Sutter-Butte By-pass Assessment No. 6, issued to the Contractor or duly endorsed to him by the original payee thereof, and registered by the State Treasurer. Such money shall be furnished, as and when called for by the Board and on presentation of warrants as aforesaid.

The obligations of this agreement shall be binding upon, and all rights thereunder shall inure to the benefit of the heirs, executors, successors and assigns of the respective parties hereto.

Members of the
Reclamation Board:

SACRAMENTO AND SAN JOAQUIN
DRAINAGE DISTRICT.

A. B. FLETCHER.

By A. B. FLETCHER,

M. C. ZUMWALT.

President of the Reclamation Board.

A. G. FOLGER.

By THOS. MAYHEW,

W. T. ELLIS.

Secretary of the Reclamation Board.

G. A. ATHERTON.

(Seal)

FRANK FREEMAN.

WILLIAM P. DWYER.

PETER COOK.

Approved as to legal form:

Approved ~~XXXXXXXXXX~~ ~~XXXXXXXXXX~~ ~~XXXXXXXXXX~~ FRANK FREEMAN,

MELVILLE DOZIER, JR.

Attorney.

General Manager and
Chief Engineer.

CONTRACT WITH W. P. DWYER—FEATHER RIVER PROJECT

No. 7.

Articles of Agreement, made and entered into in duplicate this eighteenth day of August, 1920, by and between SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT, created by the "Reclamation Board Act" of the Legislature of the State of California, acting by and through the Reclamation Board, the party of the first part, and WILLIAM P. DWYER, of the city of Sacramento, county of Sacramento, State of California, the party of the second part.

RECITALS:

A. For the sake of brevity and convenience, the Sacramento and San Joaquin Drainage District will be hereinafter called the "District," the Reclamation Board will be hereinafter called the "Board," William P. Dwyer will be hereinafter called the "Contractor," and the general manager of the Board, or any engineer that may be specially designated in writing by the Board, will be hereinafter called the "Engineer."

B. The Board has heretofore adopted plans for the construction of certain works of reclamation as authorized by law, including the

enlargement and completion of the west levee of the Feather River through Reclamation Districts No. 803 and No. 823 in Sutter County, California, opposite the town of Nicolaus. The Board has made said plans into a separate portion or project. The Board has entered in its minutes a resolution to the effect that the execution of said separate portion or project is a public necessity and has designated said portion or project by the name and number of "Feather River Project No. 7." The Board has ordered an assessment of lands within the District for the purpose of paying the cost of the works included within said Feather River Project No. 7, and incidental expenses as provided by law; said assessment being known and numbered as Feather River Assessment No. 7. The plans for said project have been duly passed and adopted on the twenty-third day of October, 1919, and the said resolution has been entered in the minutes of the Board. A copy of said plans and the Board's estimates of the cost of carrying out said plans is hereunto attached, marked "Exhibits 1 to 7" inclusive, and by this reference made a part of this agreement.

C. The Board has, by a resolution adopted on the twenty-third day of October, 1919, and entered upon its minutes, appointed three assessors to assess upon the lands within the District proposed to be assessed for the said plans adopted by the Board, the sums included in the assessment of the said Board and to apportion same according to the benefits that will accrue to each tract of land in the District, respectively, affected by said particular portion or project by reason of the expenditure of said money.

D. The said assessors have not yet made a preliminary report to the Board indicating the exterior boundaries of the lands that in their opinion were benefited by the expenditures.

E. The Board has heretofore undertaken a small portion of the work included in Project No. 7, and during the fall of 1919 raised the Feather River Levee mentioned above, to an elevation of about two or three feet above that which formerly existed, using for this work teams and scrapers.

COVENANTS:

Now, Therefore, It Is Covenanted and Agreed:

WORK TO BE DONE.

1. The District hereby employs the Contractor to perform, and the Contractor agrees to perform, all of the construction and completion of the West levee of the Feather River through Reclamation Districts No. 803 and 823 as contemplated by Feather River Project No. 7, which includes the completion of the river levee to its final grade, cross section and slopes, the removing of the old levees where the new levee follows a changed alignment, the moving of all obstructions, such as buildings, fences, trees, brush, etc., necessary for the construction of the levee and the securing of necessary material, the furnishing of flotation water for such clamshell dredges as may be used, etc. All of said work shall be done in accordance with the plans therefor duly adopted by the Board and attached hereto as exhibits, as hereinbefore recited.

CONTRACTOR'S PERCENTAGE.

2. The District agrees to pay the Contractor and the Contractor agrees to accept from the District as compensation for the performance of said work, the actual cost of said work as authorized by the Board, plus twenty-nine and one-half per cent ($29\frac{1}{2}\%$) of such actual cost.

PLANT TO BE FURNISHED BY CONTRACTOR.**Clamshell Dredges.**

3. The Contractor agrees to furnish when and as required by the Board, such clamshell dredges as shall have booms sufficiently long to construct the levee as planned and at the same time leave the required berm between the levee and the borrow pit. The said Contractor hereby agrees to float these dredges to the work during the coming winter (1920-21) when the water in the Feather River shall have reached a depth which will enable such transportation without unusual expense; and said Contractor hereby further agrees to furnish sufficient dredging equipment to complete the levee construction during the year 1921, so that the floating equipment may be carried down the Feather River to the Sacramento River during the first high water of 1921-22 without any unusual expense for such transportation.

DRAGLINE EXCAVATORS, SMALL DREDGES OR DITCHERS.

4. The Contractor agrees to furnish, when and as required by the Board, and in addition to or in lieu of floating dredges, such as draglines, small dredges, ditchers or other equipment which the Board may consider necessary or advisable in the carrying on and completion of the work herein contemplated.

BRUSH AND TIMBER CLEARING, ETC.

5. The Contractor hereby agrees to commence within fifteen (15) days after the execution of this contract, the clearing of the brush and timber necessary for the borrow pit and levee construction, and to press this work as directed by the Board, and in such manner that sufficient clearing will have been accomplished prior to the coming winter, to enable the clamshell dredges which shall be used upon this work to operate continuously through the high water period of the coming winter, so that the work will not be delayed because of lack of proper clearing during times of high water when clearing work can not be carried on. Said Contractor hereby agrees to perform prior to the coming winter any other preliminary work under Feather River Project No. 7, when and as directed by the Board.

BASE PRICES.

6. The actual cost of equipment used shall be the base prices paid for such equipment, and shall depend upon the market, or base price, existing at the time of the work, as the same shall be accepted and approved by the Board, and this shall apply whether the base price refers to cost per unit of fully equipped and operated machinery, or to a rental price for the equipment plus actual cost of labor, supplies, material, provisions, etc., for its operation.

(a) Base price is the price per hour for all approved work time when the equipment is under operation, and also for transportation

time during which any dredge shall be digging its way with full head of steam for the purpose of assisting transportation.

(b) Idle time price shall be three-fourths of base price.

(c) Idle time price is the price per hour for shutdown or idle time on account of fog, lack of water for flotation, heavy wind, injunction, or other court proceedings, or any other cause beyond the power of said District to control.

(d) The base prices hereinbefore named for large clamshell dredges, and work done with dragline excavators and ditchers or small dredges, shall include the wages of the crew and the cost of fuel, supplies, repairs and replacements and all other expenses of operating the plant. Provided, however, that the said rates are based upon the present cost of fuel oil and the present rate of wages for dredger operatives, as shown by the attached schedule market "Exhibits 8 and 9"; and if the cost of labor and fuel, or either of them, should increase or decrease, the said base rates shall be increased or decreased accordingly.

(e) The base price for all work contemplated by this contract, other than those items for which the base price is herein otherwise established, shall be the actual cost, including the rental paid for, or the rental value of, all machinery, tools, tents, wagons, automobiles, trucks, teams and other equipment furnished by the Contractor, the cost of all repairs, including replacement of parts where necessary, the cost of labor, fuel and supplies of all kinds and all other costs of operation; and there shall also be included the cost of transportation of all materials and supplies to and from the place of work and the cost of workmen's compensation, fire and automobile insurance.

(f) As to any plant or equipment of any kind that shall be supplied by the Board and used by the Contractor, the base price shall be the amount necessarily paid for repairs, including the replacement of all parts where necessary, and the cost of labor, fuel and supplies and all other costs of transportation, installation and operation thereof.

(g) If it should be necessary to purchase machinery, tools, tents, wagons, trucks, automobiles, teams or other equipment, the base price shall be the actual cost thereof, together with transportation thereof to the place where required, and the amount necessarily paid for repairs, including the replacement of all parts when necessary, and the cost of labor, fuel and supplies and all other costs of transportation, installation and operation thereof. The articles so purchased shall belong to the District.

(h) All items of cost (other than those items for which the base prices are herein otherwise established), shall be reasonable cost, and in all cases no purchase or sub-contract shall be made or let by the Contractor when the purchase or the sub-contract exceeds the sum of \$2,500, unless first submitted to the Board for approval; and the Board may, at its option, require the Contractor to receive bids on said proposed purchase or said proposed sub-contract, or the Board may itself advertise for bids in regard to said purchase or said sub-contract, and shall in all cases be the final arbiter as to what bids shall be accepted and to whom said purchase or sub-contract shall be awarded. All other costs incurred by the Contractor shall be submitted to the

Board, or such representative as it may designate, in advance, and the Board or such representative, shall act promptly upon all questions of cost submitted to it in advance, and shall hold harmless the Contractor from any loss caused by any delay in passing upon any such matters submitted to the Board.

(i) Provided that in case of emergency, to prevent loss or damage to the work under construction, the Contractor may incur costs necessary to meet the emergency, and in case of such emergency, his discretion as to such costs shall be final and conclusive.

ADDITIONAL DREDGES AND MACHINERY.

7a. Whenever the Board shall require additional dredges or other machinery to be placed upon the work, it shall give notice to the Contractor of the dredges or other machinery required, either by dimension and capacity or by name, and the Contractor shall have thirty days after the receipt of such notice to furnish such additional dredge, or such other machinery, or its equal, for the particular work required. It is understood that the number of dredges and other machinery accessible for this work is limited, and that it is not always possible to procure dredges or other machinery when and as required; and the agreement of the Contractor to obtain additional dredges or other machinery shall be limited to such machines as shall be available at the time when they shall be required.

7b. In case any dredge or other plant not on the ground at the time work under this contract begins shall be supplied by the Contractor, the cost of transportation of such dredge or other plant, from wherever it may be to the place it is required to go to work, shall be added to and become part of the base price.

WORKING CONDITIONS OF DREDGES, DRAGLINE EXCAVATORS AND DITCHERS.

8a. Work by dredgers and other equipment must be done and material placed in accordance with the directions of the Engineer, provided that the Contractor shall not be required to place material beyond the reach of the boom of any dredge while afloat in the borrow pit or dredger cut, nor shall the Contractor be required to conform to the instructions of the Engineer to any greater degree of exactness than is possible by the skillful operation of the dredges respectively.

8b. At all times the dredges, ditchers and all plant and equipment herein mentioned shall be under the direction and supervision of the Board, and the Contractor shall do no work except as directed by said Board or its representatives; provided that the Contractor shall be responsible for and have exclusive control over said dredges and other machinery and equipment and their crews and the care and mechanical operation of said dredges, and other plants. The Contractor agrees to keep said plant manned at all times, whenever the labor market shall permit, with first class, skilled, experienced operators, to maintain the machinery and equipment in first class condition, and to perform efficient work.

8c. The buckets of all large clamshell dredgers, whenever so required by the Board, shall be furnished with teeth, at the expense of the Contractor.

8d. Clocks are to be installed by the District and kept on each dredge under the control of the Engineer, for the purpose of indicating the record and handling of the dredge buckets by the levermen; and duplicate copies of all daily reports by the captain of each dredge are to be delivered daily to the Engineer.

8e. The Contractor agrees to furnish continuously, free of charge to the District, board and room on each large clamshell dredge for the inspector for the District; said room to contain a bed for the exclusive use of said inspector, and not to be used for the lodging of any of the crew of said dredge, except in case of temporary emergency.

8f. The location, height, slope and crown of the levees shall be designated by the Engineer in accordance with the plans. Before the beginning of work and during its progress the Engineer shall set stakes to indicate the height, slope and crown of said levees, such stakes at all times to cover at least one hundred feet ahead of each dredge or other equipment that shall be employed by the Contractor to do the work.

8g. It is the desire and intent of the parties that all dredges shall be operated twenty-four hours each day, except for necessary shutdowns; but it is agreed that the working hours shall be governed by the ability of the Contractor to obtain competent operatives; that is to say, if the Contractor shall be able to supply three crews of competent men, the working day shall be twenty-four hours; if he is able to supply but two crews of competent men the working day shall be sixteen hours; and if he is able to supply but one crew of competent men, the working day shall be eight hours. Each dredge shall be allowed fifteen minutes idle time during each six-hour shift for oiling machinery and equipment, for which time no deduction shall be made from Rate (a).

HAULING FUEL OIL.

9. The Contractor agrees to make his own arrangements for the securing of fuel oil for the floating clamshell dredges, and all other equipment, and in case of base price per hour, or any other unit price for work performed, shall deliver oil to his equipment at his sole cost and expense.

RIGHTS OF WAY—OBSTRUCTIONS—RESPONSIBILITY FOR DOING WORK.

10a. The District undertakes and agrees to secure all necessary rights of way for levees, drainage ditches and borrow pits and ditches, including the right to excavate and deposit material.

10b. The District assumes full responsibility for any obstructions to the operation or movement of the Contractor's dredges or other plant while engaged in the work of moving plant to or from the place of work, including trestles, bridges, levees, cuts, dams and telephone and telegraph wires. The District shall bear all costs and expenses of removing any such obstructions and replacing the same where replacements shall be necessary; and the Contractor shall not be liable for any cost or expense on account of any such obstructions and shall be

entitled to full time for plant or men held idle during any delay caused by any such obstructions. The cost of any work done and the amount of any outlays made by the Contractor in removing and replacing obstructions shall be included in the base price. Provided, however, that the Contractor shall be liable for all losses or damages caused by his negligence.

10c. The District assumes full responsibility for the performance of all work contemplated by this agreement, and undertakes and agrees to indemnify the Contractor and hold him harmless from any and all manner of loss, damage, cost or expense that shall arise out of the performance of the work hereby contemplated; and in the event of any interference with the Contractor in the performance of the work by injunction or otherwise (unless caused by the Contractor's negligence) the Contractor shall not be required to begin or continue said work, and shall not be liable for any cost or expense on account of such interference, and shall be entitled to full time and pay and percentage for plant and labor held idle during any delay caused by any such interference, except that large clamshell dredges shall be paid idle time rate and percentage. If such injunction or other interference shall not be released or withdrawn within thirty days after stoppage of work on account thereof, either party at its option may terminate this agreement. In case of termination of the contract by the District for any of the reasons stated in this paragraph, the District shall pay the Contractor for all expense, loss, cost and damages growing out of such premature termination.

10d. In case the work shall thereafter be resumed by the Board, then the Contractor shall have the right at his option to resume and complete the work under the same terms as in this agreement provided.

10e. The Contractor shall not be held liable for any loss, damages or delay caused by the breaking of a dam, or the destruction or impairment of any levee, ditch, dam or other part of the work after its once having been constructed properly by the Contractor; it being the understanding and agreement that the Contractor, working under the orders and directions of the Board and its Engineer, assumes no responsibility for the quality, stability or permanence of the work, and shall be responsible for its negligence only. In case of delay caused by the break of a dam, or any of the works, not due to the Contractor's negligence, the Contractor shall be allowed full time for all plant and labor held idle on that account.

ENGINEERS, ORDERS AND REPORTS.

11a. The Contractor agrees that at all times during the performance of this contract, his Superintendent and such assistants and representatives as he may find necessary for the supervision of the work, shall be accessible to the District and its Engineer and assistants and inspectors, for the purpose of receiving orders and making reports. The names of such Superintendent, representatives, and assistants, together with a statement of their respective powers, shall be furnished to the District by the Contractor. Receipts in writing for written orders shall be given whenever required by the Board or its Engineer or other representatives of the District.

11b. The District agrees that at all times during the performance of this contract the Engineer, and such assistants and inspectors as it may find necessary for the supervision of the work shall be accessible to the Contractor and his Superintendent and assistants, for the purpose of giving orders. The names of such Superintendent and his assistants and inspectors, together with a statement of their respective powers, shall be furnished to the Contractor by the Board. All orders given by the Board, or the Engineer or other representatives of the District, shall be given in writing whenever required by the Contractor.

11c. A copy of the daily reports of the operation of the clamshell dredges respectively, showing the time of running, the time of all stops and delays and the cause thereof, shall be furnished to the Engineer, and each of said reports shall be conclusive of the matters covered thereby, unless objection be made thereto within fifteen days after service of such copy on the Engineer. In no event shall the Contractor be liable for any stops or delays, however caused, beyond the loss of compensation for such time.

11d. Obedience by the Contractor of the orders and direction of the Board, its Engineer, and other duly accredited representatives, shall in all cases constitute a full compliance with this contract to the extent of the matter covered by such orders and directions.

LABOR TROUBLES.

12. This agreement shall be subject to strikes, lockouts or other labor disturbances, or the inability of the Contractor to obtain workmen. Whenever such strike, lockout, or other disturbance shall occur, the Contractor shall submit to the Board, or to its duly accredited Engineer having power to act, the question whether the Contractor shall retain at the place of work any machinery, plant or appliance for which the Contractor is bound to pay a rental charge, or whether the Contractor shall return such machinery, plant or appliance to the owners thereof so as to stop the rental charge during the pendency of the strike. If the decision of the Board shall be favorable to retaining the rented articles, the rental charge thereof shall be charged to the District at base price, plus Contractor's percentage, the same as if the work under this contract were being carried on.

PAYMENT TO CONTRACTOR—AUDIT OF ACCOUNTS.

13a. All sums that shall become due to the Contractor for the performance of this agreement, shall be paid to him in warrants of the District drawn upon Feather River Assessment No. 7, which warrants shall be promptly, properly and legally drawn, signed, registered and delivered to the Contractor. Warrants shall be made payable to the Contractor or his nominee, and shall be in such denominations (within the amount approved) as shall be requested by the Contractor.

13b. On or before the tenth day of each month, the Contractor shall render an account covering all work done during the preceding calendar month, and all sums due to the Contractor up to and including the last day of such preceding month.

13c. Such monthly accounts shall be audited by the Board and the Engineer, and all possible expedition shall be exercised in auditing such

accounts and delivering legal warrants therefor to the Contractor. In case any one or more items of any monthly account shall be disputed by the Board and an adjustment can not be promptly made, the Board shall nevertheless approve and cause a warrant to be issued for such parts of the account as are not disputed, and such a portion of the amount of the disputed items as will leave a reasonable margin for safety; and all disputed items shall be taken up for audit and adjustment as soon as may be practicable.

TERMINATION OF CONTRACT.

14a. It is agreed that this contract shall terminate whenever the work hereby contemplated shall have been completed.

14b. This agreement is entered into with the confident belief on the part of the parties hereto that the assessors will have completed their separate list of the lands assessed in each county and filed the same when completed with the Secretary of the Board, and that such filing will be done with all convenient dispatch; and it is agreed that if said lists shall not have been filed with the Secretary of the Board on the first day of May, 1922, the Contractor may give written notice to the Board to that effect, and demand of the Board that the said lists be filed with said Secretary, and this agreement may be terminated, at the option of the Contractor, and without further notice to the Board, if the said completed lists shall not have been filed with the Secretary of the Board within thirty days after service of said demand and notice; such demand and notice may be served by personal delivery, or by mailing, to the President or Secretary of the Board.

The obligations of this agreement shall be binding upon, and all rights thereunder shall inure to the benefit of the heirs, executors, successors and assigns of the respective parties hereto.

SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT.

	By (Signed) A. B. FLETCHER, <i>President.</i>
(Seal)	By (Signed) THOS. MAYHEW, <i>Secretary.</i>
	(Signed) W. P. DWYER, <i>Contractor.</i>

Approved as to form.

(Signed) FRANK FREEMAN,
Attorney for Reclamation Board.

STATE RECLAM

Statement of the Condition

Ledger account names	Total of all funds	Chapter 170, 1913	Revolving fund	Assessment No. 1	Assessment No. 2
<i>Assets.</i>					
Funds in hands State Treasurer—					
A—Free of encumbrance	\$72,844 78	\$203 44	\$1,908 40	\$3,008 40	
B—Reserved to pay warrants	5,662 47				
C—Reserved to pay claims	2,274 82	1,007 35	1,267 47		
Total in treasury	\$80,782 07	\$1,210 79	\$3,175 87	\$3,008 40	
Cash in bank	10,487 70		243 24		
Cash contingent fund in bank	1,232 77		1,232 77		
Cash contingent fund—vouchers	3,767 23		3,767 23		
Due from other funds, open account	16,772 29		16,772 29		
Approved claims receivable	12,037 54		12,037 54		
Registered warrants of other funds	19,578 05		14,576 45	5,001 60	
Receivable from sale of warrants					
A—Not solicited	71,134 22				
B—Solicited—reserved					
Receivable from county treasurers	4 93			4 93	
Leased lands—deferred installments	17,000 00				
Leased lands—installments due					
Assessments called, uncollected	64,870 88			50,873 44	
Assessments levied, not called	10,026,685 30				\$1,500,000 00
Total assets	\$10,824,302 98	\$1,210 79	\$51,805 39	\$58,978 37	\$1,500,000 00
<i>Liabilities.</i>					
Approved claims payable	\$2,274 82	\$1,007 35	\$1,267 47		
Account payable—W. P. Dwyer	7,119 06				
Warrants drawn not registered	188,697 90			\$5,500 00	\$5,000 00
Registered warrants	4,979,653 01				452,655 90
Accrued interest, unpaid	417,302 39				36,040 14
Warrants issuable to Board of Control	71,134 22				
Due revolving fund on open account	16,772 29	6 25		873 44	221 58
Reserve for revolving fund	50,000 00		50,000 00		
Reserve for revolving fund interest	537 92		537 92		
Total liabilities	\$5,733,411 61	\$1,013 60	\$51,805 39	\$6,373 44	\$403,917 62
<i>Revenue.</i>					
Assessments	\$11,648,840 00			\$250,000 00	\$1,500,000 00
Interest and penalties	23,939 40			14,843 97	
Appropriations	60,000 00	\$50,000 00			
Rentals	17,000 00				
Total revenue	\$11,749,788 40	\$50,000 00		\$264,843 97	\$1,500,000 00
Expenditure	7,158,897 03	49,802 81		212,230 04	493,917 62
Excess of revenue over expenditure	\$4,590,891 37	\$197 19		\$52,604 93	\$1,006,082 38
Excess of expenditure over revenue					

REPORT OF CALIFORNIA RECLAMATION BOARD.

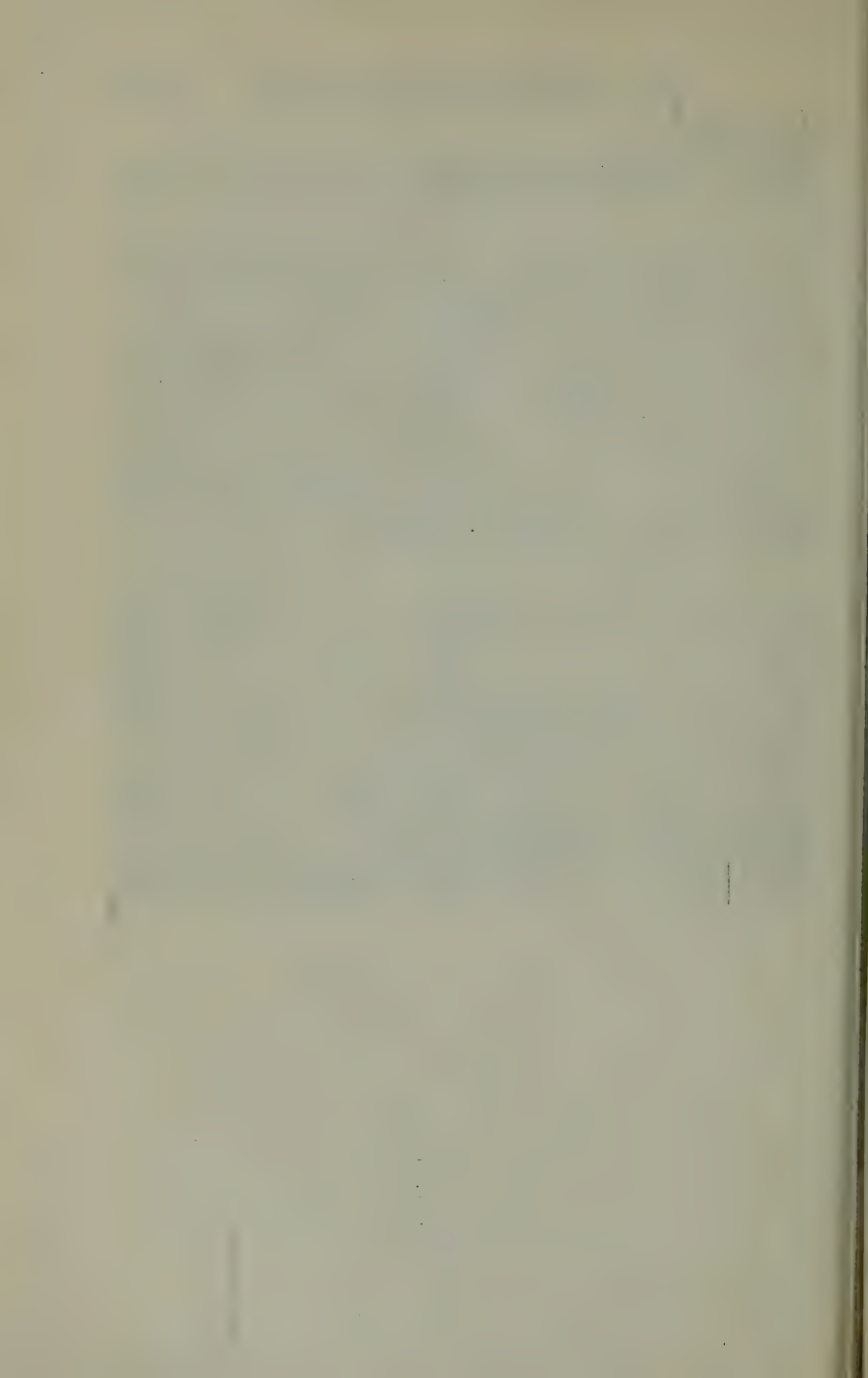
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MATION BOARD.

of Funds, December 31, 1920.

Assessment No. 3	Assessment No. 4	Assessment No. 5	Assessment No. 6	Chapter 7, 1919	Chapter 556, 1919	Assessment No. 7	Projects not assessed
\$37,679 16	\$19,955 38		\$5,662 47		\$10,000 00		
\$37,679 16	\$19,955 38		\$5,662 47		\$10,000 00		
500 00	2,500 00		6,298 94			805 52	
2,000 00	15,000 00						
13,995 87		\$0 57					
			8,155,798 70			370,886 60	
\$54,176 03	\$37,455 38	\$0 57	\$8,167,700 11	\$71,134 22	\$10,000 00	\$371,782 12	
			\$6,223 54			\$895 52	
			178,107 90				
			4,451,497 82			75,509 29	
			378,315 20			2,947 05	
\$237 00			752 95	\$71,134 22		1,225 63	\$13,455 44
\$237 00			\$5,014,897 41	\$71,134 22		\$80,577 49	\$13,455 44
\$1,095,000 00	\$219,000 00	\$58,163 70	\$8,155,798 70			\$370,886 60	
2,960 31	3,790 03	2,345 09					
					\$10,000 00		
2,000 00	15,000 00						
\$1,099,967 31	\$237,790 03	\$60,508 79	\$8,155,798 70		\$10,000 00	\$370,886 60	
1,046,021 28	200,334 65	60,508 22	5,002,986 00			79,681 97	\$13,455 44
\$53,939 03	\$37,455 38	\$0 57	\$3,152,862 70		\$10,000 00	\$291,204 63	\$13,455 44

O



REPORT
OF
Superintendent of
State Printing

FOR THE
Seventieth and Seventy-first Fiscal Years

July 1, 1918 to June 30, 1920



CALIFORNIA STATE PRINTING OFFICE
Sacramento, 1921

2010/11/12



LETTER OF TRANSMITTAL.

SACRAMENTO, CALIFORNIA,

February 8, 1921.

To His Excellency, WILLIAM D. STEPHENS,

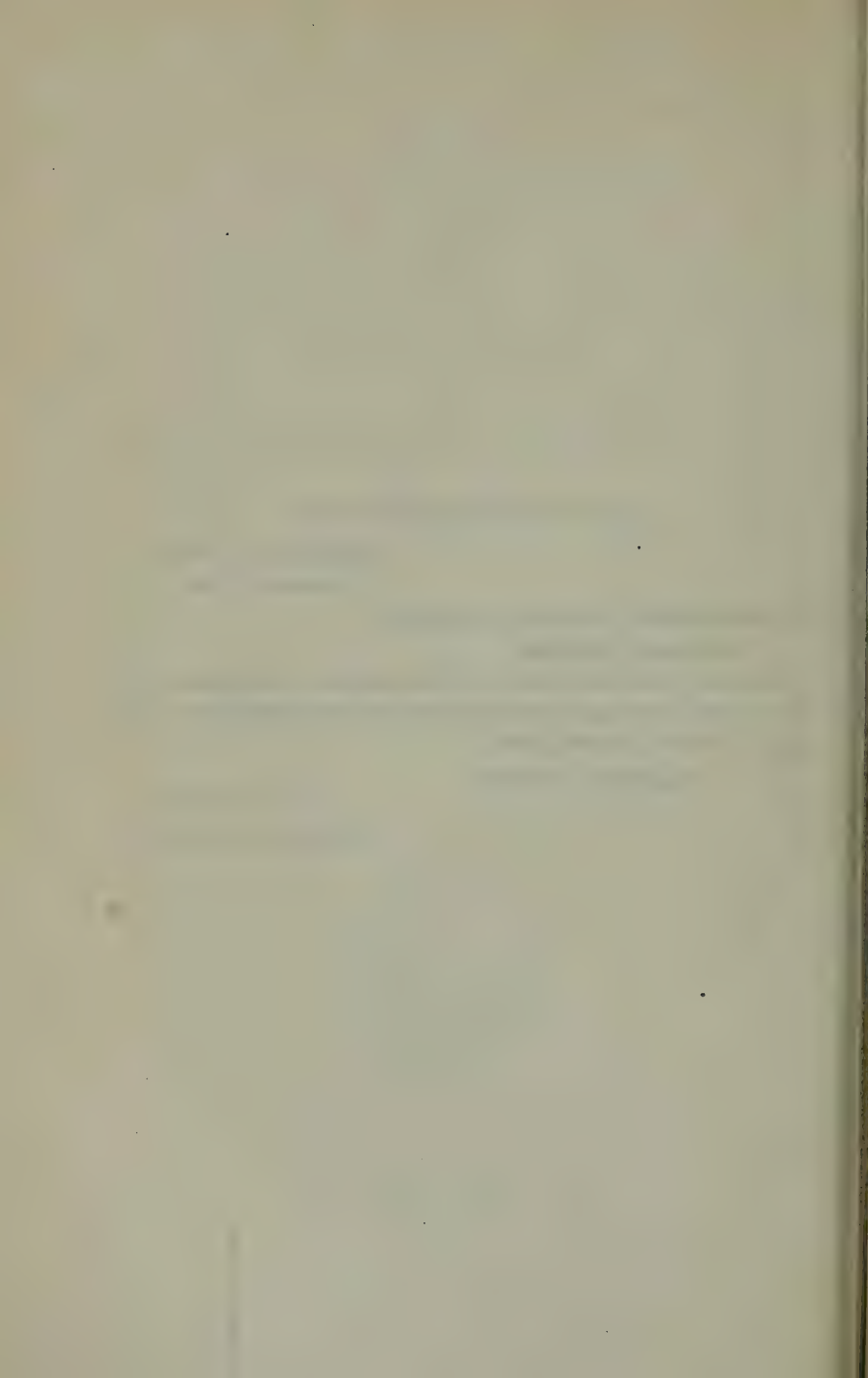
Governor of California.

DEAR SIR: I herewith submit the biennial report of the Superintendent of State Printing for the seventieth and seventy-first fiscal years, July 1, 1918, to June 30, 1920.

Respectfully submitted.

D. D. SULLIVAN,

Deputy Superintendent.



DEPARTMENT OF STATE PRINTING.

FINANCIAL STATEMENTS.

BALANCE SHEET FOR SEVENTIETH AND SEVENTY-FIRST FISCAL YEARS.

	June 30, 1919	June 30, 1920
ASSETS		
Warrants receivable	\$17,461 32	\$27,866 32
Machinery and equipment	115,303 86	118,799 94
Revolving fund		500 00
Uncompleted work	32,850 60	14,839 44
Accounts receivable	45,108 17	48,461 82
Printing and binding materials	113,400 77	134,482 08
Suspense—unused stores, etc.		39 17
Appropriations available	111,480 93	100,000 00
Printing fund	24,588 49	64,107 66
Totals	\$463,194 14	\$509,096 43
LIABILITIES		
Claims payable—sundry	\$17,461 32	\$27,866 32
Accounts payable (this is advance payments)	37,092 36	60,234 44
Appropriations	111,480 93	100,000 00
Reserve for vacations	7,378 07	8,839 31
Department of Printing	*286,781 46	*312,156 36
Totals	\$460,164 14	\$509,096 43

*Increase of \$25,374 90 over previous balance is due to the following items:

Reserve to cover depreciation and purchase of new equipment	\$19,246 44
Equipment from legislative appropriation	1,022 88
Overs in stock account	3,631 98
Equipment purchased from School Book Fund	1,473 60

\$25,374 90

STATEMENT OF INCOME AND EXPENDITURES FOR THE SEVENTIETH
AND SEVENTY-FIRST FISCAL YEARS.

	1918-1919	1919-1920
SALES		
Printing sales	\$491,379 00	\$557,065 55
Waste paper sales	1,712 89	1,503 18
Old equipment and material	142 05	231 27
Fire arms record books	594 07	819 00
	\$493,827 18	\$559,613 00
Less cost of miscellaneous sales	608 05	902 03
	\$493,219 43	\$558,710 97
Discounts earned	507 07	202 59
Total income	\$493,727 00	\$558,913 56
EXPENSES		
Material used in manufacturing:		
Paper, envelopes, etc.	\$171,651 32	\$214,729 96
Binding material	36,064 71	45,669 29
Printing inks	1,417 15	2,427 71
Rubber stamp material	266 45	313 41
Halftones, zincos, etc.	21,300 46	12,339 16
Labor used in manufacturing:		
Composing room	80,083 32	63,305 96
Press room	34,359 00	40,615 90
Bindery	79,540 44	104,541 96
General expense items	33,160 31	32,721 61
Sales of previous years:		
Unfinished work	10,746 42	18,011 16
	\$477,500 78	\$539,667 12
Reserve for depreciation and purchase of equipment	16,136 22	19,246 44
	\$493,727 00	\$558,913 56

LEGISLATIVE APPROPRIATIONS FOR EQUIPMENT, SALARY OF SUPERIN-
TENDENT AND DEPUTY.

	1918-1919	1919-1920
RECEIPTS		
By appropriations	\$9,706 18	\$11,480 93
DISBURSEMENTS		
Salary of superintendent	5,000 00	5,000 00
Salary of deputy	2,400 00	2,978 05
Machinery	2,306 18	1,022 88
Insurance		2,500 00
	\$9,706 18	\$11,480 93
Appropriation by State Board of Education for purchase of special machine for use in binding school books (School Book Fund)		\$1,473 60
Bracket stripping machine purchased		1,473 60

ACCOUNTS RECEIVABLE AS OF JUNE 30, 1920.

Advisory Pardon Board.....	\$ 0 22
Agriculture Society.....	4,871 63
Department of Agriculture.....	775 94
Department of Agriculture—Stallion Registration.....	4 66
Department of Agriculture—Apple Standardization.....	8 56
Department of Agriculture—Fertilizer Control.....	22 79
Department of Agriculture—Cattle Protection Board.....	142 69
Department of Agriculture—Traveling and Contingent Expenses, State Veterinarian.....	9 19
Attorney General.....	134 00
Adjutant General.....	236 00
Adjutant General—High School Cadets.....	10 39
Banking Department.....	117 35
Bureau of Criminal Identification.....	34 85
Bureau of Labor Statistics—Public Employment.....	150 25
Bureau of Labor Statistics.....	202 07
Board of Charities and Corrections.....	70 65
Board of Control.....	624 78
Board of Control—Salary and Support Children's Agents.....	55 80
Board of Dental Examiners.....	47 81
Board of Education.....	50 77
Board of Education—Vocational Education Fund.....	70
Board of Education—School Book Fund.....	12,925 07
Board of Education—Traveling and Contingent Fund.....	225 35
Board of Education—Permanent Fund.....	1 67
Board of Equalization.....	112 81
Board of Forestry.....	21 50
Board of Health.....	410 94
Board of Health—Traveling and Contingent Expenses.....	26 58
Board of Health—Tuberculosis Fund.....	12 74
Board of Health—Contagious Disease.....	56 15
Board of Health—Nurses' Registration.....	74 57
Board of Health—Hygienic Laboratory.....	24 01
Board of Health—Social Hygienic Bureau.....	32 24
Board of Health—Venereal Disease.....	368 59
Board of Health—Sanitary Engineering Department Appropriation.....	129 76
Board of Medical Examiners.....	2,074 58
Board of Optometry.....	263 42
Board of Pharmacy.....	88 36
Board of Prison Directors.....	7 11
California School for Deaf and Blind.....	21 85
California School for Girls.....	146 81
California Polytechnic School.....	165 95
Civil Service Commission.....	26 47
Commission in Lunacy.....	122 04
Compensation Insurance Fund.....	342 31
Controller's Office.....	317 03
Controller—Inheritance Tax.....	105 23
Controller—Collection of State Revenue.....	26 79
Corporation Department.....	849 47
Engineering Department.....	318 51
Executive and Administrative Department.....	395 56
Fish Exchange.....	61 81
Fish and Game Commission.....	1,270 88
Harbor Commission.....	372 25
Highway Commission.....	3,705 66
Historical Survey Commission.....	70 04
Home for Adult Blind.....	23 04
Immigration and Housing Commission.....	283 05
Industrial Accident Commission.....	881 12
Industrial Farm for Women.....	10 76
Industrial Welfare Commission.....	292 94
Insurance Commission.....	2,574 49
Judicial Department—Clerk of Supreme Court.....	19 72
Judicial Department—First District Court of Appeal.....	59 79
Judicial Department—Second District Court of Appeal.....	64 56

Judicial Department—Third District Court of Appeal.....	60 80
Land Settlement Board.....	231 54
Legislative Counsel Bureau.....	642 28
Legislature.....	1,448 35
Library Trustees.....	1,444 99
Mining Bureau.....	157 52
Mining Bureau—Petroleum and Gas Fund.....	845 42
Motor Vehicle Department.....	626 41
State Asylums.....	21 35
Normal School—Chico.....	183 72
Normal School—Fresno.....	227 98
Normal School—Humboldt.....	96 72
Normal School—San Diego.....	10 39
Normal School—San Francisco.....	322 46
Normal School—San Jose.....	214 45
Normal School—Santa Barbara.....	424 17
Preston School of Industry.....	349 83
Prison at Folsom.....	234 24
Prison at San Quentin.....	455 67
Railroad Commission.....	1,144 69
Reclamation Board.....	107 74
Redwood Park Commission.....	11 26
Real Estate Commission.....	62 86
Secretary of State.....	569 33
Secretary of State—Corporation Licenses.....	14 20
State Purchasing Department.....	172 69
Superintendent of Public Instruction.....	763 05
Surveyor General.....	86 60
Sutter's Fort Trustees.....	16 77
Treasurer's Office.....	86 46
Veterans' Home of California.....	135 29
Water Commission.....	20 46
Weights and Measures Department.....	3 55
Whittier State School.....	52 07
Woman's Relief Corps.....	6 67
Independent Paper Stock Company.....	255 16

\$48,461 \$2

ABSTRACT OF ACCOUNTS PAYABLE AS OF JUNE 30, 1920.

American Railway Express Company.....	\$5 36
American Type Founders Company.....	46 55
E. C. Atkins and Company.....	13 50
Blake, Moffit and Towne.....	423 00
Bonestell and Company.....	2,414 15
J. W. Bowman.....	9 70
Bowmans Hardware and Implement Company.....	44
Harry W. Brintnall.....	32 40
California Ink Company.....	260 45
California Glue Company.....	666 90
Campbell and Boutwell.....	40
City of Sacramento.....	45 00
H. S. Crocker Company.....	38 60
L. P. Degin Belting Company.....	26 50
Dome Engraving Company.....	123 47
Eaton, Crane and Pike.....	198 23
Egan Brothers Company.....	1 20
E. C. Fuller Company.....	71 70
Glade, Hipp and Meloy.....	118 80
Goodrich, Ballard and Rouse.....	1 65
Great Western Power Company.....	229 01
Norman F. Hall Company.....	13 65
Hale Brothers, Incorporated.....	16 58
Hansen Machine Works.....	34 45
Heller, Klein and Company.....	38 15
Ideal Coated Paper Company.....	49 43

Kirk, Geary and Company	12 54
C. H. Krebs and Company	16 00
Leitch Drayage and Warehouse Company	1 05
Friend and Terry Lumber Company	911 58
Marsh and Kidd Corporation	118 44
L. W. Matthias	54 30
Mergenthaler Linotype Company	24 79
Miehle Printing Press and Manufacturing Company	1 00
Miller Saw-Trimner Company	12 96
R. and L. Myers Company	1 35
Pacific Coast Paper Company	338 97
Pacific Gas and Electric Company	67 11
Pacific Telephone and Telegraph Company	16 00
Pernau-Walsh Printing Company	18 50
Peet Brothers Manufacturing Company	7 50
Premier and Potter Printing Press Company	12 88
Printing Department (Revolving Fund)	50 02
Protzman and Stephens	165 60
Geo. Russell Reed Company	9 00
Jas. S. Remick Company	8 00
Richardson-Case Paper Company	876 67
R. Rosenberg and Sons	19 84
Sacramento Gas Company	21 75
Sacramento Oxy-Acetylene Welding Works	7 90
Sacramento Tent and Awning Company	44 00
Schaw-Batcher Company	8 14
Joseph E. Smythe	111 30
Standard Oil Company	63 57
State Purchasing Department	118 78
Superior Type Company	2 10
Superintendent Capitol Building and Grounds	11 40
Sutter Photo-Engraving Company	18 50
Thompson-Diggs Company	15 93
Wasserman-Gattmann Company	640 82
Western Union Telegraph Company	2 06
Western Soap Products Company	5 00
Wet Wash Laundry Company	15 18
Zellerbach Paper Company	8,184 71
	<hr/>
	\$16,894 51
State printing plant employees—pay roll for last half of June, 1920	10,971 81
	<hr/>
	\$27,866 32

PAY ROLLS BY MONTHS.

Fiscal Year, July, 1919, to June, 1920.

1919—	
July	\$17,875 65
August	21,144 72
September	21,107 33
October	22,292 38
November	19,565 77
December	19,876 72
1920—	
January	\$19,446 90
February	16,810 36
March	17,932 98
April	17,155 49
May	17,191 69
June	21,144 94
	<hr/>
	\$231,544 93

STATEMENT OF DEPARTMENTAL COSTS.

Fiscal Year 1919-1920.

	Amount	Hours	Average cost per hour
Linotype composition	\$33,579 41	21,824	\$1.54
Proof reading	13,936 73	9,340	1.50
Hand composition, etc.	26,977 93	19,669	1 38
Cylinder press work	34,109 53	21,492	1 59
Platen press work	9,825 30	9,472	1 04
Stock cutter	3,511 47	2,159	1 63
Ruling machines	4,232 51	3,130	1 36
Folder (double 16)	830 42	928	0 80
Bundling	433 24	481	0 91
Fold and bundling machine ..	7,692 41	2,965	2 56
Gathering machine	2,374 24	554	4 65
Smythe sewing machines	9,257 63	9,253	1 00
Compressor	1,461 60	1,300	1 13
Book trimmers	6,551 58	5,084	1 29
Rounder and backing machine ..	3,975 13	1,862	2 14
Board cutter	1,451 65	1,257	1 16
Case maker	6,066 08	2,710	2 24
Power stamper	2,221 44	1,765	1 26
Casing-in machine	4,133 49	1,374	3 00
Book pressing	3,130 62	3,097	1 02
Girls machines	6,693 63	9,784	0 69
Forwarding	20,068 65	18,461	1 12
Finishing	3,692 89	3,446	1 08
Girls' hand work	37,781 77	60,527	0 63
Job folder	1,337 42	1,476	0 91
Men's machines	94 59	79	1 20
Rubber stamp department	564 09		
Totals	\$246,185 43	213,494	\$1 49

SUMMARY OF CHARGES TO STATE DEPARTMENTS FOR PRINTING,
BINDING, ETC.

	1918-1919	1919-1920
Agnews State Hospital	\$4 34	.....
Advisory Pardon Board .....	.....	\$2 41
Agricultural Society	7,612 25	9,761 94
Department of Agriculture .....	.....	14,437 24
Sixth District Agricultural Society	59 91	4 14
Attorney General—Office	1,705 90	1,921 53
Adjutant General—Office	7,976 07	1,941 75
Adjutant General—High School Cadets	714 88	264 53
Banking Department	4,183 16	4,943 50
Building and Loan Commission	399 95	371 97
Bureau of Criminal Investigation	233 61	171 94
Bureau of Labor Statistics—Public Employment	281 28	2,376 70
Bureau of Labor Statistics	4,254 56	2,574 61
Board of Accountancy .....	.....	30 42
Board of Architecture	74 15	13 52
Board of Charities and Corrections	1,511 52	462 15
Board of Control	3,678 54	4,719 63
Board of Dental Examiners	725 79	273 51
Board of Education	10,312 46	10,077 73
Board of Education—School Book Fund	160,368 87	206 325 32
Board of Embalmers	169 93	182 55
Board of Equalization	1,723 67	1,388 61
Board of Forestry	1,660 08	1,286 68
Board of Health	10,788 93	13,747 52
Board of Medical Examiners	2,623 51	5,697 26
Board of Optometry	153 05	355 56
Board of Pharmacy	387 71	676 88
Board of Prison Directors	10 92	28 28
California School for Deaf and Blind, Berkeley	179 28	398 72
California School for Girls, Ventura	331 30	302 62
Cattle Protection Board	1,137 06	179 96
California Polytechnic School	393 33	789 32
Children's Year Committee	1,064 85	.....
Civil Service Commission	1,660 13	620 35
Commission of Horticulture	8,958 89	145 07
Commission on Lunacy	4,124 64	5,127 47
Committee on Readjustment .....	.....	914 85
Compensation Insurance Fund	3,839 57	7,215 80
Controller's Office	6,292 78	5,137 45
Corporation Department	1,054 62	3,048 23
Committee on Readjustment	569 89	.....
Counsel of Defense	3,750 59	.....
Dairy Bureau	634 35	9 25
District Exemption Board No. 3	64 90	.....
Engineering Department	2,283 91	3,157 21
Executive Administrative Department	684 73	698 85
Fish Exchange	450 92	254 07
Fish and Game Commission	4,023 05	7,194 85
Harbor Commission, Eureka	28 06	74 23
Harbor Commission, San Francisco	4,673 28	5,207 98
Highway Commission	9,191 35	14 994 06
Historical Survey Commission	67 56	3,554 68
Home for Adult Blind, Oakland	319 47	415 33
Immigration and Housing Commission	2,943 82	1,928 13
Industrial Accident	11,672 69	13,774 80
Industrial Farm for Women .....	.....	10 76
Industrial Welfare Commission	993 85	2,321 09
Insurance Commission	4,179 74	6,926 56
Irrigation Board of California .....	.....	16 99
Judicial Department—Clerk of Supreme Court	1,444 96	1,044 30
Judicial Department—First District Court of Appeal	376 12	1,072 58
Judicial Department—Second District Court of Appeal	484 71	552 77
Judicial Department—Third District Court of Appeal	424 69	304 90
Land Settlement Board	786 72	2,205 70
Legislative Counsel Bureau	728 70	16 47
Legislature	87,956 74	11,551 63
Library Trustees	7,902 41	8,896 76

**SUMMARY OF CHARGES TO STATE DEPARTMENTS FOR PRINTING,
BINDING, ETC.—Concluded.**

	1918-1919	1919-1920
Marshall Monument		1 24
Mining Bureau	11,232 42	10,672 76
Motor Vehicle Department	24,508 18	31,993 84
State Asylums	29 45	49 66
Normal School—Chico	435 23	575 20
Normal School—Fresno	206 35	831 08
Normal School—Humboldt, Arcata	725 87	451 51
Normal School—Los Angeles	1,629 29	181 94
Normal School—San Diego	754 49	595 80
Normal School—San Jose	1,310 24	1,417 13
Normal School—San Francisco	780 14	1,000 00
Normal School—Santa Barbara	185 03	552 88
Pacific Colony	47 84	23 14
Preston School of Industry	165 46	613 02
Prison at Folsom	655 45	675 15
Prison at San Quentin	760 28	962 01
Railroad Commission	11,804 67	27,600 44
Reclamation Board	1,025 26	987 61
Redwood Park Commission	63 18	64 02
Real Estate Commission		4,892 74
Secretary of State	27,635 96	4,115 07
Social Insurance Department	582 39	
Stallion Registration Board	191 20	126 71
State Market Commission	574 27	567 50
State Purchasing Department	2,139 42	2,9 9 74
Superintendent Capitol Building and Grounds	11 69	27 94
Superintendent Public Instruction	2,947 42	16,768 16
Surveyor General	373 34	1,482 73
Sutter's Fort Trustees	15 96	16 77
Treasurer's Office	1,274 53	823 53
United States Public Service Revenue	29 11	
University of California		15 77
Veterans' Home of California	843 11	1,183 34
State Veterinarian	417 97	22 61
Viticultural Commission	598 12	467 02
Water Commission	316 42	441 26
Weights and Measures Department	1,169 33	1,050 32
Whittier State School	49 25	331 96
Women's Relief Corps		6 67
Sundry sales of fire arms register	594 00	810 00
State Printer	1,560 13	2,962 13
Sales, miscellaneous, waste, old equipment, etc.	1,772 95	2,022 65
	\$496,958 44	\$573,776 80

SALES, MISCELLANEOUS, WASTE, OLD EQUIPMENT, ETC.

	1918-1919	1919-1920
H. Roth and Son		\$47 72
American Type Founders Company		143 45
Elizabeth Beckley		15 00
Great Western Smelting and Refining Company		208 70
J. E. Hopkins, Stockton		5 00
Independent Paper Stock Company		1,506 18
Rex Rubber Stamp Company		6 50
Edward O. Strong		0 10
J. M. Welsh (for old material)	\$3 00	
H. T. Durden	42 31	
John T. Holders	27 25	
Independent Paper Stock Company	267 04	
National Paper Products Company	23 05	
R. Rosenberg and Sons	394 25	
Western Paper Stock Company	1,016 03	
	\$1,772 95	\$2,022 65

AID TO VARIOUS STATE DEPARTMENTS FROM VARIOUS OFFICERS FUND.

1918-1919.

Building and Loan Commission	\$269 73
Superintendent Public Instruction	1,825 64
Efficiency Committee	34 04
Board of Control	24 13
Commission of Horticulture	258 22
Lunacy Commission	615 44
Treasurer	98

\$3,028 18

1919-1920.

Surveyor General	\$632 73
San Francisco Normal	65 08
First District Court of Appeal	7 49
Industrial Welfare Commission	208 73
Land Settlement Board	159 11
Building and Loan Commission	286 17
Lunacy Commission	213 62
First District Court of Appeal	5 42

1,578 35

Total ----- \$4,606 53

SUMMARY OF TEXTBOOKS PRINTED.

July 1, 1918, to June 30, 1919.

	Number	Amount
Primer	26,890	\$3,792 21
First Reader	25,300	4,260 83
Second Reader	25,290	4,430 85
Third Reader	25,200	5,320 10
Fourth Reader	24,785	6,539 17
Fifth Reader	25,205	7,002 38
Eight Reader	25,095	7,503 11
Speller, Book One	196,770	5,614 39
Speller, Book Two	134,005	4,832 09
Speller, Teachers' Manual	10,236	1,553 46
Elementary Arithmetic	15,310	2,578 31
Advanced Arithmetic	12,810	2,567 11
Beginners' History	25,260	7,102 11
Introductory Geography	25,276	8,279 68
Advanced Geography	25,162	13,960 98
Music, Book One	118,710	20,663 42
Music, Book Two	106,843	19,850 03
Music, Book Three	89,585	17,901 99
Teachers' Music Manual, Vol. I	9,165	3,007 04
Teachers' Music Manual, Vol. II	7,600	2,708 02
Teachers' Music Manual, Vol. III	9,255	3,074 96
Writing Book, Book III	24,555	417 59
Writing Book, Book V	24,600	418 36
Writing Book, Book VIII	25,800	435 77
	1,088,641	\$153,816 96

SUMMARY OF TEXTBOOKS PRINTED.

July 1, 1919, to June 30, 1920.

	Number	Amount
Primer	26,175	\$4,377 66
Primer of Hygiene	19,989	3,223 46
First Reader	25,250	5,138 57
Second Reader	25,250	5,010 06
Third Reader	25,140	5,771 77
Fourth Reader	25,000	6,076 43
Fifth Reader	25,000	6,271 63
Seventh Reader	25,209	6,116 16
Eighth Reader	24,930	6,711 05
Speller Manual	5,062	684 70
Speller, Book II	25,650	921 97
Elementary Arithmetic	36,949	6,751 10
Advanced Arithmetic	27,153	6,371 53
Studies in English	64,580	7,540 42
English Lessons, Book II	163,856	37,393 94
English Lessons, Book III	84,652	21,995 54
Beginner's History	25,000	7,844 83
Introductory Geography	35,150	11,058 10
Advanced Geography	29,437	15,900 60
Civics	5,100	1,233 80
Music Reader, Book I	25,650	3,747 66
Music Reader, Book II	25,200	4,095 96
Music Reader, Book III	50,126	10,486 75
	824,835	\$184,723 69

SCHOOL BOOKS MANUFACTURED.

Quantity	Description	Total manufacturing cost	Book average
	September, 1918		
25,260	Beginner's History (Mace)	\$7,102 11	.281
	February, 1919		
118,710	Music Book I	20,663 42	.176
106,843	Music Book II	19,850 03	.186
89,585	Music Book III	17,901 99	.20
25,102	Advanced Geography	13,960 98	.555
9,165	Teachers' Music Manual, Vol. I	3,067 04	.329
7,600	Teachers' Music Manual, Vol. II	2,708 02	.357
9,255	Teachers' Music Manual, Vol. III	3,074 96	.393
	March, 1919		
25,200	Third Reader	5,320 10	.212
24,785	Fourth Reader	6,539 17	.175
25,095	Eighth Reader	7,503 11	.299
25,270	Introductory Geography	8,279 68	.328
	April, 1919		
171,490	New Speller—Book I	4,891 27	.03
134,005	New Speller—Book II	4,892 09	.137
25,290	Second Reader	4,430 85	.176
25,205	Fifth Reader	7,602 38	.278
10,236	Teachers' Manual for New Speller	1,553 46	.152

SCHOOL BOOKS MANUFACTURED—Continued.

Quantity	Description	Total manufac- turing cost	Book average
May, 1919			
25,300	First Reader -----	4,260 83	.169
24,600	Copy Book—Five -----	418 36	.171
25,800	Copy Book—Eight -----	438 77	.171
24,555	Zaner Writing Book Three-----	417 59	.171
15,310	Elementary Arithmetic -----	2,578 31	.17
12,810	Advanced Arithmetic -----	2,567 11	.201
June, 1919			
25,280	Speller—Book One -----	723 12	.029
26,890	Primer -----	3,792 21	.141
1,038,641		\$153,816 96	
July, 1919			
25,650	Speller—Book II -----	\$921 97	.036
August, 1919			
9,989	Primer of Hygiene -----	1,438 54	.145
25,200	Seventh Reader -----	6,116 16	.243
September, 1919			
10,150	Introductory Geography -----	3,243 26	.32
5,100	Civics -----	1,233 80	.238
64,580	Studies in English -----	7,540 42	.117
October, 1919			
25,050	Music Reader—I -----	3,747 66	.15
25,200	Music Reader—II -----	4,095 96	.163
25,026	Music Reader—III -----	4,859 02	.196
15,000	Elementary Arithmetic -----	2,516 02	.168
10,050	Advanced Arithmetic -----	2,173 88	.217
November, 1919			
14,509	Advanced Geography -----	7,807 58	.543
January, 1920			
5,062	Speller Manual -----	684 70	.136
February, 1920			
25,000	Introductory Geography -----	7,814 84	.313
25,200	Second Reader -----	5,010 06	.199
10,000	Primer of Hygiene -----	1,784 92	.179
March, 1920			
25,000	Fourth Reader -----	6,076 43	.243
25,000	Beginner's History (Mace) -----	7,844 83	.314
April, 1920			
163,856	English Lessons—Book II -----	37,393 94	.229
84,652	English Lessons, Book III -----	21,995 54	.26
14,928	Advanced Geography -----	88,033 02	.54
21,940	Elementary Arithmetic -----	4,235 08	.194
25,140	Third Reader -----	5,771 77	.23
25,000	Fifth Reader -----	6,271 63	.251
May, 1920			
17,103	Advanced Arithmetic -----	4,197 65	.246
24,630	Eighth Reader -----	6,711 05	.27
26,170	Primer -----	4,377 66	.168
June, 1920			
25,250	First Reader -----	5,138 57	.204
25,100	Music Reader—III -----	5,587 73	.223
824,835		\$184,723 69	

LEGISLATIVE BILL ROOM MAILING ACCOUNT.

Appropriated by Forty-third Legislature (Chapter 5)-----		\$3,000 00
Drawn—		
January 28, 1919-----	\$1,000 00	
April 7, 1919-----	500 00	
July 31, 1919-----	200 00	
Total amount drawn-----	\$1,700 00	\$1,700 00
Unused balance-----		\$1,300 00

PURCHASED FROM APPROPRIATION FOR MACHINERY, ETC.

(Chapter 422, Stats. 1919.)

MACHINERY.

1 75-horsepower motor-----	\$924 00
140 pieces metal furniture 4 x 20 ems-----	11 17
1 font 18-point brass type No. 5154, 100 type-----	8 82
1 font 12-point brass type No. 5147, 100 type-----	7 35
1 font 18-point brass type No. 5366, 100 type-----	8 82
1 font 12-point brass type No. 5368, 100 type-----	7 35
1 font 16-point brass type No. 5350, 100 type-----	8 33
2 fonts 16-point brass type No. 5351, 100 type-----	14 70
2 fonts 16-point brass type No. 5241, 100 type-----	16 66
2 fonts 14-point brass type No. 5225, 100 type-----	15 68
	<hr/>
	\$1,022 88

PURCHASES, PAPER STOCK.

Envelopes.

1919-1920.

4,500 No. 5 White envelopes-----	\$8 83
50,000 No. 6½ White envelopes-----	105 00
1,303,000 No. 6½ White envelopes-----	2,440 05
25,000 No. 7 White envelopes-----	67 50
25,000 No. 9 White envelopes-----	111 25
926,000 No. 10 White envelopes-----	2,724 29
15,000 No. 11 White envelopes-----	81 75
15,000 No. 12 White envelopes-----	88 05
10,000 No. 14 White envelopes-----	46 90
2,000 No. 6½ White Linen Finish Certificate Bond envelopes-----	10 58
3,000 No. 6½ White Linen Finish Tisrite Bond envelopes-----	11 13
9,500 No. 9 Oak Bond envelopes-----	73 63
500 No. 6½ White L. F. Re-Order Bond envelopes-----	2 44
20,000 No. 50 5½ x 8½ O. E. white envelopes-----	108 20
500 No. 11 White Policy envelopes-----	4 32
208,000 No. 6½ White Outlook envelopes-----	356 24
115,000 No. 10 White Outlook envelopes-----	609 45
2,000 White Check Window envelopes-----	15 30
500 No. 11 White Cloth Lined envelopes-----	24 64
250 No. 12 White Cloth Lined envelopes-----	13 45
1,500 No. 14 White Cloth Lined envelopes-----	92 33
7,500 No. 5 Manila envelopes-----	9 30
208,000 No. 6½ Manila envelopes-----	240 56
378,000 No. 6½ Manila envelopes-----	711 10
13,000 No. 7 Manila envelopes-----	22 62
42,000 No. 9 Manila envelopes-----	91 24
224,500 No. 10 Manila envelopes-----	666 77
25,000 No. 11 Manila envelopes-----	78 00
23,000 No. 12 Manila envelopes-----	86 50
200,000 No. 6½ Manila Outlook envelopes-----	416 00
18,000 No. 9 Manila Outlook envelopes-----	81 54
108,000 No. 10 Manila Outlook envelopes-----	354 24

PURCHASES, PAPER STOCK—Continued.

26,500	5½ x 9	O. S. Manila Outlook envelopes	200 08
500	No. 14	Manila Columbia Clasp envelopes	5 87
5,000	No. 20	Manila Columbia Clasp envelopes	36 85
15,000	No. 30	Manila Columbia Clasp envelopes	110 35
5,000	No. 35	Manila Columbia Clasp envelopes	35 15
5,000	No. 50	Manila Columbia Clasp envelopes	71 00
15,000	No. 55	Manila Columbia Clasp envelopes	160 50
10,000	No. 60	Manila Columbia Clasp envelopes	161 90
9,500	No. 63	Manila Columbia Clasp envelopes	108 21
3,000	No. 65	Manila Columbia Clasp envelopes	53 28
3,000	No. 70	Manila Columbia Clasp envelopes	57 03
33,500	No. 75	Manila Columbia Clasp envelopes	513 48
25,000	No. 80	Manila Columbia Clasp envelopes	340 51
10,000	No. 90	Manila Columbia Clasp envelopes	187 90
10,000	No. 93	Manila Columbia Clasp envelopes	141 50
10,000	No. 95	Manila Columbia Clasp envelopes	142 80
5,000	4½ x 9½	Manila Open End envelopes	15 65
27,000	No. 6 5½ x 8½	Manila Open End envelopes	119 34
10,000	No. 36 5½ x 8½	Manila Open End envelopes	19 40
500	No. 36 5½ x 7½	Manila Open End envelopes	1 87
100,000	No. 50 6½ x 9½	Manila Open End envelopes	376 00
3,000	6½ x 9½	Manila Open End envelopes, not gummed—heavy	14 97
20,000	No. 10	Manila Postage Saver envelopes	38 00
1,075	3½ x 5½	India O. S. Special envelopes	17 50
			<hr/>
			\$12,682 34

Ledger Paper.

1919-1920.

15,750	sheets	22 x 34	56-lb. Hammermill white	\$494 42
10,750	sheets	22 x 34	56-lb. Hammermill buff	364 38
14,000	sheets	22 x 34	71-lb. Hammermill white	572 55
10,000	sheets	17 x 22	28-lb. Reliance white	216 72
3,500	sheets	17 x 28	35-lb. Reliance blue	96 79
3,500	sheets	17 x 28	35-lb. Reliance buff	96 79
10,000	sheets	21 x 32	57-lb. Reliance white	389 88
9,000	sheets	21 x 32	57-lb. Reliance blue	389 88
10,000	sheets	21 x 32	57-lb. Reliance buff	410 40
2,000	sheets	22 x 34	56-lb. Reliance white	82 99
9,250	sheets	22 x 34	64-lb. Reliance blue	469 59
5,000	sheets	22 x 34	64-lb. Reliance buff	256 64
10,000	sheets	23 x 31	68½-lb. Reliance white	473 34
3,500	sheets	23 x 36	71-lb. Reliance white	192 34
3,250	sheets	23 x 36	71-lb. Reliance blue	186 91
6,500	sheets	17 x 28	40½-lb. Resolute white	157 95
43,000	sheets	21 x 32	57-lb. Resolute white	1,376 32
10,000	sheets	24 x 38	68-lb. Resolute white	408 00
1,000	sheets	24 x 36	80-lb. Resolute buff	54 40
27,500	sheets	17 x 22	28-lb. Pacific white	459 23
32,500	sheets	17 x 28	35½-lb. Pacific white	723 39
15,500	sheets	17 x 28	40½-lb. Pacific white	406 78
30,500	sheets	16 x 21	28½-lb. Pacific white	506 84
16,200	sheets	21 x 32	57-lb. Pacific blue	627 71
72,006	sheets	21 x 32	57-lb. Pacific white	2,372 05
12,750	sheets	21 x 32	57-lb. Pacific buff	497 10
14,250	sheets	22 x 34	56-lb. Pacific white	500 35
19,000	sheets	23 x 36	71-lb. Pacific white	823 03
8,475	sheets	21 x 32	57-lb. Tisrite blue	160 44
5,000	sheets	21 x 32	57-lb. Tisrite white	200 00
5,227	sheets	23 x 36	71-lb. Tisrite white	222 68
7,493	sheets	23 x 36	80-lb. Tisrite white	438 19
10,000	sheets	17 x 28	40½-lb. Vulcan white	291 60
			<hr/>	
				\$14,919 68

Shipping Tags.

2,000	No. 3-G	Manila shipping tags	\$1 90
20,000	No. 5-G	Manila shipping tags	23 40
5,000	No. 8-E	Manila shipping tags	14 65
10,000	No. 8-G	Manila shipping tags	15 70
			<hr/>
			\$55 65

PURCHASES, PAPER STOCK—Continued.

Textbook Paper.

758,425	sheets	31 x 42	80-lb.	-----	\$14,444	47
3,172,025	sheets	31 x 46	90-lb.	-----	56,693	54
186,050	sheets	31 x 46	110-lb.	-----	4,277	29
104,900	sheets	33 x 50	104-lb.	-----	2,720	47
719,275	sheets	34 x 51	100-lb.	-----	16,704	03
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					\$94,839	80

Cover Paper.

1919-1920.

1,500	sheets	20 x 25	65-lb.	Buckeye, buff	-----	\$53	64
8,500	sheets	20 x 26	65-lb.	Buckeye, brown	-----	299	60
16,000	sheets	20 x 26	65-lb.	Buckeye, French gray	-----	564	69
14,000	sheets	20 x 26	65-lb.	Buckeye, Nile green	-----	482	69
1,000	sheets	23 x 33	95-lb.	Buckeye, brown	-----	47	02
22,475	sheets	23 x 33	95-lb.	Buckeye, French gray	-----	1,056	88
115	sheets	23 x 33	95-lb.	Buckeye, India ripple	-----	7	81
30	sheets	23 x 33	Double Thick	Buckeye, India ripple	-----	4	70
195	sheets	23 x 38	80-lb.	Modern, green stucco	-----	5	62
765	sheets	22 x 28	80-lb.	Modern, sage stucco	-----	22	03
880	sheets	22 x 28	80-lb.	Modern, sage ripple	-----	25	35
693	sheets	22½ x 28½	80-lb.	Modern, red	-----	23	56
2,000	sheets	20 x 25	60-lb.	Wawona, olive green	-----	54	60
3,500	sheets	20 x 25	35-lb.	S. & S. C., cherry	-----	38	96
2,000	sheets	20 x 25	35-lb.	S. & S. C., apple green	-----	31	50
15,000	sheets	20 x 25	65-lb.	S. & S. C., fawn	-----	333	60
5,000	sheets	20 x 25	65-lb.	Interwoven Quaker, gray	-----	160	88
14,900	sheets	25 x 33	124-lb.	Practical, gray	-----	565	60
2,500	sheets	20 x 25	65-lb.	Interwoven, buff	-----	74	75
815	sheets	20 x 25	100-lb.	Cabinet, dark blue	-----	36	68
6,440	sheets	40 x 48	200-lb.	No. 1 Kraft	-----	409	18
2,500	sheets	18 x 31	40-lb.	Manuscript, chocolate	-----	70	15
3,010	sheets	18 x 31	40-lb.	Manuscript, terra cotta	-----	91	06
2,500	sheets	18 x 31	40-lb.	Manuscript, opaline	-----	70	15
					<hr/>		
					\$4,530	70	

Cardboard.

18,000	sheets	22½ x 28½	2-ply	Bristol, white	-----	864	40
34,500	sheets	22½ x 28½	3-ply	Bristol, white	-----	1,970	50
4,500	sheets	22½ x 28½	3-ply	Bristol, yellow	-----	240	90
3,000	sheets	22½ x 28½	3-ply	Bristol, blue	-----	153	55
500	sheets	22½ x 28½	3-ply	Bristol, fawn	-----	24	75
4,300	sheets	22½ x 28½	3-ply	Bristol, pink	-----	229	90
1,000	sheets	22½ x 28½	3-ply	Bristol, cherry	-----	57	20
2,750	sheets	22½ x 28½	8-ply	blanks, white	-----	232	20
1,000	sheets	22½ x 28½	6-ply	Railroad board, red	-----	95	00
200	sheets	No. 88	kid finish	cards	-----	40	
1,000	sheets	160-lb.	Iron tag	board	-----	69	60
2,000	sheets	260-lb.	Iron tag	board	-----	215	28
11,500	sheets	22½ x 28½	120-lb.	Manila tag board	-----	258	12
2,500	sheets	22½ x 28½	140-lb.	Manila tag board	-----	75	60
1,000	sheets	22½ x 28½	160-lb.	Manila tag board	-----	36	48
2,000	sheets	28½ x 45	240-lb.	Manila tag board	-----	72	00
3,500	sheets	25½ x 30½	108-lb.	Index Bristol, blue	-----	225	08
1,000	sheets	25½ x 30½	110-lb.	Index Bristol, white	-----	56	00
1,500	sheets	25½ x 30½	110-lb.	Index Bristol, buff	-----	75	90
1,000	sheets	25½ x 30½	110-lb.	Index Bristol, cherry	-----	64	20
2,500	sheets	25½ x 30½	110-lb.	Index Bristol, salmon	-----	140	10
10,800	sheets	25½ x 30½	140-lb.	Index Bristol, buff	-----	826	12
1,500	sheets	25½ x 30½	140-lb.	Index Bristol, salmon	-----	117	45
8,849	sheets	25½ x 30½	140-lb.	Index Bristol, blue	-----	681	31
963	sheets	25½ x 30½	220-lb.	Index Bristol, blue	-----	144	45
320	sheets	25½ x 30½	220-lb.	Index Bristol, buff	-----	42	02
					<hr/>		
					\$6,968	51	

PURCHASES, PAPER STOCK—Continued.

Bond Paper.

1919-1920.

12,000	sheets	17 x 28	20½-lb.	Advance, pink	\$125 56
100,000	sheets	8½ x 11	10-lb.	Agawam, white	302 00
12,500	sheets	17 x 22	9-lb.	Agawam, white	230 00
7,500	sheets	17 x 22	16-lb.	Agawam, white	129 60
1,000	sheets	17 x 26	15½-lb.	Agawam, white	22 00
17,500	sheets	17 x 28	16½-lb.	Agawam, white	381 61
18,750	sheets	22 x 34	32-lb.	Atlantic, white	208 80
10,000	sheets	17 x 28	16½-lb.	Bank, white	142 68
5,000	sheets	17 x 28	20½-lb.	Bank, russet	68 00
5,000	sheets	17 x 28	25½-lb.	Bank, blue	66 81
4,224	sheets	17 x 28	25½-lb.	Bank, yellow	53 86
15,000	sheets	22 x 34	32-lb.	Bank, green	312 00
10,000	sheets	22 x 34	32-lb.	Bank, russet	176 64
25,000	sheets	22 x 34	40-lb.	Bank, white	590 00
7,500	sheets	22 x 34	24-lb.	Bay Path, pink	159 15
4,000	sheets	22 x 34	24-lb.	Bay Path, golden rod	88 56
4,000	sheets	22 x 34	24-lb.	Bay Path, blue	84 00
930	sheets	17 x 22	16-lb.	Certificate, blue	7 07
20,000	sheets	17 x 28	20½-lb.	Certificate, white	278 24
30,000	sheets	17 x 28	20½-lb.	Certificate, canary	316 99
15,000	sheets	17 x 28	20½-lb.	Certificate, blue	173 33
5,000	sheets	17 x 28	20½-lb.	Certificate, green	62 32
7,100	sheets	17 x 28	20½-lb.	Certificate, golden rod	86 75
50,000	sheets	17 x 28	20½-lb.	Certificate, pink	488 17
7,500	sheets	22 x 34	26-lb.	Certificate, pink	150 48
28,584	sheets	22 x 34	32-lb.	Certificate, pink	493 94
17,005	sheets	22 x 34	32-lb.	Certificate, blue	276 16
153,285	sheets	22 x 34	40-lb.	Certificate, white	2,885 16
15,396	sheets	24 x 38	39-lb.	Certificate, white	276 21
10,000	sheets	17 x 28	20½-lb.	Columbian, buff	109 68
5,000	sheets	17 x 28	20½-lb.	Columbian, gray	54 84
12,500	sheets	22 x 34	26-lb.	Columbian, white	214 00
12,500	sheets	22 x 34	32-lb.	Columbian, golden rod	212 00
10,000	sheets	17 x 22	No. 21	Cranes, white	221 00
12,500	sheets	17 x 22	No. 25	Cranes, white	337 50
4,000	sheets	17 x 22	No. 25	Cranes, white	136 80
5,000	sheets	17 x 28	16½-lb.	English, white	68 30
12,500	sheets	17 x 28	20½-lb.	English, golden rod	170 71
10,000	sheets	17 x 28	20½-lb.	English, buff	120 21
7,500	sheets	17 x 28	20½-lb.	English, russet	96 45
5,000	sheets	17 x 28	20½-lb.	English, blue	66 50
47,500	sheets	17 x 28	20½-lb.	English, white	705 17
10,000	sheets	22 x 34	24-lb.	English, canary	200 80
7,500	sheets	22 x 34	24-lb.	English, buff	168 45
20,500	sheets	22 x 34	32-lb.	English, opaline	411 56
8,000	sheets	22 x 34	32-lb.	English, russet	165 28
12,500	sheets	22 x 34	32-lb.	English, pink	219 20
20,000	sheets	22 x 34	32-lb.	English, canary	350 72
2,500	sheets	22 x 34	40-lb.	English, opaline	62 70
5,000	sheets	22 x 34	40-lb.	English, pink	117 20
6,750	sheets	22 x 34	40-lb.	English, blue	170 10
5,000	sheets	24 x 38	39-lb.	English, canary	114 27
2,500	sheets	24 x 38	39-lb.	English, blue	57 14
5,000	sheets	24 x 38	39-lb.	English, buff	114 27
50,000	sheets	22 x 34	40-lb.	Equity, white	1,010 00
12,500	sheets	28 x 34	33-lb.	Exchange, white	396 68
18,000	sheets	22 x 34	32-lb.	Hammermill, russet	279 93
3,944	sheets	22 x 34	32-lb.	Ivanhoe, canary	41 65
35,285	sheets	28 x 44	40-lb.	Map, white	1,214 05
12,500	sheets	17 x 28	20½-lb.	Marine, blue	166 05
58,000	sheets	17 x 22	8-lb.	Superior Manifold, white	474 30
10,000	sheets	17 x 28	10-lb.	Superior Manifold, white	103 40
8,000	sheets	22 x 34	16-lb.	Superior Manifold, white	129 60
25,000	sheets	22 x 34	32-lb.	Messenger, blue	330 40
25,000	sheets	22 x 34	40-lb.	Nibrock, white	299 00
10,000	sheets	22 x 34	40-lb.	Oak, green	328 00
32,425	sheets	22 x 34	32-lb.	Optimo, canary	371 78
130,000	sheets	22 x 34	32-lb.	Optimo, white	1,252 80
1,000	sheets	34 x 44	80-lb.	Optimo, white	29 20

PURCHASES, PAPER STOCK—Continued.

19,628	sheets	17 x 28	20½-lb. Orient, white	189 10
5,000	sheets	17 x 28	25½-lb. Orient, white	78 03
8,000	sheets	22 x 34	32-lb. Orient, buff	165 89
20,000	sheets	17 x 28	16½-lb. Reliance, white	287 82
10,000	sheets	22 x 34	32-lb. Reliance, golden rod	270 72
7,500	sheets	22 x 34	40-lb. Reliance, green	233 70
10,000	sheets	17 x 28	25½-lb. Standard, buff	203 87
10,000	sheets	17 x 28	25½-lb. Standard, pink	203 87
5,000	sheets	17 x 28	25½-lb. Standard, blue	119 34
2,500	sheets	17 x 28	16-lb. Standard, white	38 03
12,500	sheets	17 x 22	10-lb. Strathmore, white	258 75
500	sheets	19 x 24	12-lb. Strathmore, white	10 20
9,220	sheets	17 x 28	16½-lb. Tisrite, white	146 30
9,280	sheets	17 x 28	16-lb. Tisrite, russet	81 67
2,330	sheets	17 x 28	20-lb. Tisrite, golden rod	27 03
758	sheets	17 x 28	20-lb. Tisrite, blue	8 80
6,000	sheets	17 x 28	20-lb. Tisrite, white	87 60
3,145	sheets	22 x 34	32-lb. Tisrite, golden rod	58 38
6,416	sheets	22 x 34	32-lb. Tisrite, pink	110 87
5,100	sheets	22 x 34	32-lb. Tisrite, blue	94 66
2,000	sheets	22 x 34	40-lb. Tisrite, white	58 40
3,355	sheets	22 x 34	40-lb. Tisrite, corn	77 84
2,440	sheets	22 x 34	40-lb. Tisrite, blue	56 61
2,788	sheets	22 x 34	40-lb. Tisrite, golden rod	64 69
12,500	sheets	17 x 28	20½-lb. Trust, white	148 00
100,000	sheets	5 x 7½	Yosemite, white	86 00
525	sheets	17 x 22	16-lb. Yosemite, white	2 88
4,000	sheets	22 x 34	32-lb. Yosemite, white	43 78
4,500	sheets	22 x 34	32-lb. Yosemite, canary	48 00
2,000	sheets	22 x 34	40-lb. Yosemite, white	27 36

\$23,015 97

Book Paper.

1919-1920.

608,900	sheets	38 x 50	80-lb. M. F.	\$10,890 14
275,050	sheets	30 x 50	96-lb. M. F.	4,285 54
251,750	sheets	38 x 50	100-lb. M. F.	6,621 03
495,575	sheets	38 x 50	112-lb. S. and S. C.	10,876 99
35,250	sheets	38 x 50	120-lb. S. and S. C.	1,003 23
5,500	sheets	25 x 38	60-lb. Antique wove flat rock, white	97 35
1,000	sheets	32 x 44	119-lb. Plymouth Rock, wove, white	51 17
625	sheets	25 x 38	60-lb. Arctic coated book	14 81
10,000	sheets	38 x 50	160-lb. white coated book	489 60
5,000	sheets	25 x 38	80-lb. egg shell paper	134 00
2,500	sheets	32 x 46	120-lb. egg shell paper, white	116 10
19,000	sheets	28 x 42	62-lb. Clipper book	245 35
6,500	sheets	38 x 50	80-lb. Empere book	157 17
11,000	sheets	38 x 50	130-lb. Duchess	400 40
19,000	sheets	25 x 38	100-lb. India art mat	986 40
1,000	sheets	25 x 38	imported Bible paper	22 00
250	sheets	24 x 36	brown cloth lined paper for covers	100 00

\$36,491 28

Flat Paper.

1919-1920.

17,500	sheets	17 x 28	30½-lb. Oakland flat, white	\$240 19
22,325	sheets	24 x 38	49-lb. Oakland flat, white	555 89
10,000	sheets	24 x 38	59-lb. Oakland flat, white	286 74
10,000	sheets	17 x 28	24-lb. Hamberg, white	86 40
15,000	sheets	17 x 28	25½-lb. Liberty	137 70
4,000	sheets	17 x 28	30½-lb. Sunset	26 38
95,250	sheets	34 x 44	96-lb. Sunset	1,976 93
528,850	sheets	17 x 28	30½-lb. Palo Alto	5,466 57
2,500	sheets	17 x 28	40½-lb. Palo Alto	51 94
9,500	sheets	28 x 34	61-lb. Palo Alto	315 40
37,500	sheets	22 x 34	40-lb. Carmel	553 00

PURCHASES, PAPER STOCK—Continued.

15,000	sheets	17 x 22	24-lb. colored, dark blue	194 40
12,500	sheets	17 x 22	24-lb. colored, salmon	150 00
22,500	sheets	17 x 22	24-lb. colored, light blue	285 60
12,500	sheets	17 x 22	24-lb. colored, amber	162 00
7,500	sheets	17 x 22	24-lb. colored, pink	77 40
15,000	sheets	17 x 22	24-lb. colored, canary	194 40
6,500	sheets	17 x 22	24-lb. colored, green	94 63
1,600	sheets	17 x 22	24-lb. colored, cherry	21 89
5,000	sheets	17 x 22	24-lb. colored, fawn	64 80
12,500	sheets	17 x 22	30½-lb. colored, pink	197 34
3,500	sheets	17 x 22	30½-lb. colored, green	64 37
75,000	sheets	17 x 22	30½-lb. colored, dark blue	1,111 72
5,000	sheets	17 x 22	30½-lb. colored, blue	82 35
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				\$12,398 04

Manila Paper.

50,000	sheets	17 x 28	20½-lb. Chemical, Manila yellow	\$249 08
442	sheets	17 x 28	20½-lb. Chemical, white	4 66
7,500	sheets	17 x 28	20½-lb. Chemical, blue	42 19
12,500	sheets	17 x 28	20½-lb. Chemical, pink	71 75
10,000	sheets	19 x 24	24-lb. Chemical, yellow	77 80
175,000	sheets	22 x 34	32-lb. Chemical, yellow	1,593 28
2,000	sheets	22 x 34	32-lb. Chemical, blue	29 44
25,000	sheets	22 x 34	32-lb. Chemical, pink	207 36
186,375	sheets	22 x 34	32-lb. Chemical, white	1,568 24
6,500	sheets	24 x 38	39-lb. Chemical, yellow	98 11
28,404	sheets	28 x 34	41-lb. Chemical, white	277 01
240	sheets	24 x 36	30-lb. Hercules, white	1 51
720	sheets	24 x 36	30-lb. Buckeye, white	3 65
13,680	sheets	40 x 48	150-lb. Manila	396 00
12,000	sheets	40 x 48	200-lb. Jute Manila	625 00
24,480	sheets	36 x 48	200-lb. Jute Manila	1,287 00
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				\$6,532 08

Miscellaneous.

2,500	sheets	20 x 26	green glazed paper	\$40 00
63,500	sheets	8½ x 11	Mimeograph paper	81 07
16,000	sheets	17 x 22	16-lb. Mimeograph paper	93 28
2,500	sheets	20 x 30	American tissue paper	5 75
11	rolls	2-ply	Ravenite building paper, 36-inch	19 23
240	pieces	5 x 8	genuine parchment	88 00
500	pieces	17 x 22	artificial parchment	47 50
3,000	sheets	17 x 28	Safety paper, stone	72 00
3,000	sheets	17 x 28	Safety paper, primrose	91 20
5,000	sheets	17 x 28	Safety paper, green	152 00
9,000	sheets	17 x 28	Safety paper, blue	213 50
5,000	sheets	17 x 22	blue French folio	25 20
12,500	sheets	17 x 22	green French folio, unglazed	63 00
5,000	sheets	17 x 28	blue French folio, unglazed	32 90
5,000	sheets	17 x 28	canary French folio, unglazed	32 90
12,500	sheets	22 x 34	green French folio, unglazed	134 00
10,000	sheets	19 x 24	French folio tissue paper, 1-lb.	68 00
Lot of waste paper				1 00
				<hr/>
				\$1,260 53

PURCHASES, BINDERY MATERIAL.

1919-1920.

26,523	yards red brown cloth	\$8,093 96
35,400	yards brown cloth	9,664 20
2,000	yards olive green cloth	720 00
52,501	yards light brown cloth	15,575 61
25,500	yards light gray cloth	8,329 50
504	yards 36-inch bleached Indian head muslin	185 57
160	yards No. 236 linen weave purple cloth	59 20
114	yards No. D81 purple shot grain cloth	37 62
562	yards art buckram—assorted colors	426 16
24	yards white oil cloth	9 85
187	yards No. 72 silk basket book cloth	102 35
142½	yards corduroy	135 14
80	yards green art canvas (P)	38 40
376	yards brown vellum T28½	118 44
5,169½	yards blue star muslin	882 89
1,814½	yards 44-inch bleached Indian head muslin	867 62
236	yards light blue gingham	84 40
40	yards No. 400 brown library buckram	27 20
100	yards red satin for diploma portfolios	195 00
1661½	yards flannelette	421 23
195	yards green record buckram	100 63
Lot	yards purple silk for memorial resolutions	10 35
360	yards blue head band	18 00
9,360	yards ½-inch white sewing tape	140 30
30	pieces tab stock	8 01
240	library titles	21 66
500	bookform card cases	14 23
20,500	eyelets	13 64
20,000	white eyelets	4 15
Lot	of fly leaves for school books	92 00
1	No. 1 42 Rubberset brush	43
4	dozen safety pins	34
1	ball colored twine	65
36	cans car-mu-cha	21 60
20	packs gold leaf	261 00
8	packs Dejonge imitation gold leaf, 5 x 5	48 06
5,000	No. 2 round head counting house staples	7 00
300	pounds No. 1 quality padding composition	61 50
9	sheets wadding for portfolios	72
2	pounds balsam copaiba	2 70
65	pounds bookbinders ink—blue	110 00
20	pounds bookbinders ink—yellow No. 480	25 00
5	pounds bookbinders ink—black No. 544	6 25
15	pounds bookbinders ink—red No. 282	26 25
45	pounds bookbinders ink—brown No. 63	56 25
71	top lock metals for loose leaf binders	96 60
99	binder metal parts—end locks	99 61
7	steel ledger metals for loose leaf binders	31 95
50	loose leaf binder keys	3 00
300	Rubber knobs for binder posts	10 89
3,360	sheets 36 x 48 150-lb. rag lining paper	46 12
5,000	sheets 36 x 48 125-lb No. 1 Kraft paper	148 75
24,780	sheets 40 x 48 150-lb. Kraft paper	735 53
502½	reams 23 x 40 63-lb. Kraft paper	2,723 55
5,000	sheets 25 x 38 80-lb. rough lining paper	136 80
7	sheets 20 x 26 double face carbon paper	28
500	sheets 8½ x 14 water grain black paper	4 00
300	yards 1½-inch white gum Holland	4 80
300	yards 1½-inch black gum Holland	4 80
300	yards 1½-inch brown gum Holland	4 80
12,000	yards ¾-inch gum Holland	89 64
300	yards ¾-inch white gum Holland	2 40
300	yards ¾-inch black gum Holland	2 40
122,980	yards ¾-inch brown gum Holland	758 28
300	yards 1-inch brown gum Holland	3 60
300	yards 1-inch black gum Holland	3 60
155,270	yards 1-inch white gum Holland	1,270 23
125	sheets 28 x 42 012 tan stencil board	24 25
50	sheets 28 x 42 020 tan stencil board	19 00

PURCHASES, BINDERY MATERIAL—Continued.

25	sheets 28 x 42 030 tan stencil board.....	14 25
200	bundles 40 x 30 No. 21 binders board.....	677 40
44	bundles 24½ x 38½ No. 25 Davy tar board.....	116 32
42	bundles 24 x 28 No. 20 tar board.....	131 50
201	bundles 25½ x 32 No. 25 tar board.....	477 22
3,685	bundles 23 x 31½ No. 30 tar board.....	9,576 88
81	bundles 22 x 28 No. 20 Davy tar board.....	274 35
150	bundles 24 x 28 No. 30 tar board.....	690 00
80	bundles 26 x 38 No. 20 straw board.....	342 40
199	feet black Morocco leather.....	137 31
1,673½	feet wine Morocco leather.....	928 65
5½	feet acid free olive green Morocco.....	2 20
4½	feet acid free dark red Morocco.....	1 80
102½	feet red water grain buffing.....	29 66
864½	feet No. 1 red boarded grain buffing.....	259 35
822½	feet cross grains black cowhide.....	287 88
524½	feet No. 2 red cowhide.....	298 82
78½	yards red straight grain imitation leather.....	117 49
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		\$67,613 92

PURCHASES, RUBBER STAMP MATERIAL.

1919-1920.

18	sets extra bands for No. 6 Triumph daters.....	\$3 60
6	No. 2 Midget band daters.....	9 30
12	sets extra bands for Royal daters.....	4 80
4	B B type daters.....	12 00
6	ordinary Midget self inkers.....	6 60
6	bottles purple ink.....	1 80
6	sets extra bands for No. 3 Perfected daters.....	2 10
6	No. 4 Midget band daters.....	12 00
5	No. 6 Midget band daters.....	12 00
3	No. 8 Triumph self inkers.....	3 75
1	No. 5 Midget band daters.....	2 40
3	No. 4-5 A. C. mounts—mortised.....	45
3	No. 3-5 A. C. mounts—mortised.....	44
25	strips 2-inch grooved mounts.....	2 50
140	strips 1½-inch grooved mounts.....	12 25
125	No. 4 handles.....	1 75
1,000	No. 3½ handles.....	8 75
6	No. 14 Kossuth type daters.....	16 50
168	sets solid rubber daters.....	30 00
6	sets No. 1½ plain self ink bands.....	1 20
6	No. 12½ Standard self inkers.....	19 50
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		\$163 69

INVENTORY, 1919-1920: JUNE 30, 1920.

Rubber Stamp Stock.

3	American time stamps.....	\$2 75
1	American check protector.....	1 75
4	0-6 and 1-6 Pioneer numberers bands.....	52
1	No. 3-6 A. S. band numberer.....	25
6	extra bands for No. 6 Midget daters.....	1 20
4	extra bands for No. 3 Perfected daters.....	2 10
5	extra bands for Royal and Superior dates.....	2 00
3	extra bands for No. 1 Standard.....	90
4	Acme daters.....	1 20
5	Crown ledger daters.....	3 00
1	No. 0 Crown dater.....	09
6	No. 2 Midget band daters.....	9 30
1	No. 5 Midget band dater.....	2 40
2	No. 6 Midget band daters.....	3 70
3	No. 10 Midget line band daters.....	2 25
2	No. 25 Midget line band daters.....	1 60
1	No. 40 Midget line band dater.....	72
4	No. 1 Model dater, style "D".....	4 00

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

7	Perfected daters	6 30
43	No. 1 Pioneer line daters	5 64
6	1½ Pioneer line daters	17
12	2 Pioneer line daters	2 16
5	1 Simplex daters	4 60
2	2 Simplex daters	1 60
1	1 Standard band dater	2 25
1	2 Standard band daters	3 00
12	Superfine daters	14 60
11	Triumph line daters	7 89
6	Utility daters—metal	11 70
2	No. 1 Victor daters, No. 1 plates	80
2	No. 1½ Victor daters, No. 2 plates	80
1	No. 2 dater, No. 2 plates	50
80	Solid rubber dates	8 33
282	handles	2 48
5	short handles, flexible	25
3	short handles, flexible	15
29	½-oz. bottles ink	2 60
3	1-oz. bottles opaque ink	3 40
13	1-oz. bottles ink	2 30
11	1½-oz. bottles Superb ink	92
18	2-oz. bottles ink	7 20
18	2½-oz. cans quick drying ink	3 91
32½	bottles numbering machine ink	9 07
50	pounds moulding compound	6 65
12	Ideal mounts—flexible handles	3 65
6	2 x 5 air cushion stamp mounts	84
	Piece of muslin	07
1	extra band for Midget dater	20
11	No. 2 A. C. pockets	82
3	No. 3 A. C. pockets	71
	Miscellaneous mountings, mortised and plain	97 20
1	pair No. 1 banded pads	09
6	pairs No. 2 banded pads	63
4	pairs No. 3 banded pads	47
2	pairs No. 4 banded pads	30
2	Bates numbering machine ink pads	30
27	No. 0 Supreme pads	2 55
62	No. 1 Supreme pads	8 78
62	No. 2 Supreme pads	12 16
58	No. 3 Supreme pads	18 30
9	special Supreme pads	69
26	C Supreme self-inking stamp pads	3 02
20	D Supreme self-inking stamp pads	2 85
19	E Supreme self-inking stamp pads	4 50
3	No. 1½ A. S. word printers	90
3	No. 2 A. S. word printers	1 50
57	pounds rubber stamp rubber	53 20
1	pound sponge rubber 10 x 24½	93
6	No. 1½ ordinary Midget self-inker	1 32
2	No. 2 ordinary Midget self-inker	64
5	No. 3 ordinary Midget self-inker	2 16
5	No. 4 ordinary Midget self-inker	3 00
3	No. 4½ ordinary Midget self-inker	1 62
2	No. 5 ordinary Midget self-inker	1 08
9	No. 6 ordinary Midget self-inker	8 40
1	No. 1 Standard self-inker	1 20
2	No. 1½ Standard self-inker	9 80
2	No. 2 Standard self-inker	3 20
1	No. 2½ Standard self-inker	2 80
2	No. 3 Standard self-inker	5 20
2	No. 4 Standard self-inker	8 00
1	No. 8 Triumph self-inker—plain	1 25
2	Bates stem springs for numbering machines	40
15	Solid rubber dates	1 45

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

Book Paper.

6,397	sheets	25 x 38	100-lb. India art mat book paper	\$350 07
385	sheets	25 x 38	60-lb. white antique wove flat rock	6 81
300	sheets	25 x 38	Imported Bible paper	6 60
3,475	sheets	29 x 43	120-lb. brief paper, white	111 82
1,980	sheets	28 x 42	62-lb. Clipper	25 18
45	sheets	24 x 36	brown cloth lined	18 00
250	sheets	12½ x 19	80-lb. coated	1 57
150	sheets	25 x 38	100-lb. coated	4 32
150	sheets	25 x 38	80-lb. coated	3 78
1,250	sheets	28 x 42	100-lb. coated	26 30
165	sheets	38 x 50	160-lb. coated	8 08
9	sheets	22 x 40	60-lb. eggshell	07
5,835	sheets	25 x 38	80-lb. eggshell	149 99
2,358	sheets	32 x 46	120-lb. eggshell	108 99
108	sheets	25 x 38	60-lb. laid	1 30
15,750	sheets	38 x 50	96-lb. M. F.	245 40
179,900	sheets	38 x 50	80-lb. M. F.	3,756 31
245,485	sheets	38 x 50	100-lb. No. 1. M. F.	6,456 24
357,000	sheets	38 x 50	80-lb. news	4,426 80
30	sheets	25 x 38	60-lb. Railroad Folder, yellow	54
2,857	sheets	25 x 38	60-lb. Railroad Folder, blue	50 57
1,550	sheets	25 x 38	60-lb. Railroad Folder, pink	28 36
85	sheets	26 x 40	Trinity Bible paper	4 60
2,500	sheets	28½ x 50	98-lb. S. & S. C.	20 75
200,509	sheets	38 x 50	112-lb. S. & S. C.	4,693 51

Cover Paper.

\$20,505 96

7,870	sheets	20 x 25	50-lb. S. & S. C. Cover, granite	\$115 44
7,385	sheets	20 x 25	50-lb. S. & S. C. Cover, fawn	108 31
200	sheets	20 x 25	50-lb. S. & S. C. Cover, green	2 93
337	sheets	20 x 25	50-lb. S. & S. C. Cover, pearl	4 95
104	sheets	20 x 25	35-lb. S. & S. C. Cover, cherry	48
72	sheets	20 x 25	35-lb. S. & S. C. Cover, straw	33
37	sheets	20 x 25	50-lb. S. & S. C. Cover, India	55
68	sheets	22 x 28	60-lb. S. & S. C. Cover, Mandarin	66
363	sheets	20 x 25	65-lb. Buckeye Cover, pink	9 45
211	sheets	20 x 25	65-lb. Buckeye Cover, scarlet	5 50
1,595	sheets	20 x 26	65-lb. Buff Cover, Pacific Coast	47 69
3,520	sheets	20 x 25	65-lb. S. & S. C. Cover, fawn	74 22
12,094	sheets	20 x 25	65-lb. Buckeye Cover, India	315 04
108	sheets	20 x 25	65-lb. Buckeye Cover, primrose	2 81
6,455	sheets	20 x 26	65-lb. Buckeye Cover, Nile green	222 53
1,801	sheets	20 x 26	65-lb. Buckeye Cover, French gray	62 11
4,263	sheets	20 x 26	65-lb. Buckeye Cover, brown	148 56
379	sheets	20 x 25	65-lb. Buckeye Cover, buff	13 04
19	sheets	22½ x 28½	80-lb. Buckeye Cover, Nile green	57
4,059	sheets	22½ x 28½	80-lb. Buckeye Cover, India	119 89
40	sheets	22½ x 28½	80-lb. Buckeye Cover, azure	1 19
587	sheets	22 x 28	Modern Cover, sage ripple	16 91
765	sheets	22 x 28	80-lb. sage stucco Modern Cover	22 03
195	sheets	22 x 28	80-lb. green stucco Modern Cover	5 62
593	sheets	23 x 33	95-lb. Antique Buckeye Cover, brown	27 88
5,256	sheets	23 x 33	95-lb. Antique Buckeye Cover, French gray	247 29
2,538	sheets	18 x 31	40-lb. Manuscript Cover, primrose	64 38
753	sheets	18 x 31	40-lb. Manuscript Cover, emerald	7 53
5,583	sheets	18 x 31	40-lb. Manuscript Cover, blue	141 60
2,244	sheets	18 x 31	40-lb. Manuscript Cover, chocolate	62 97
3,010	sheets	18 x 31	40-lb. Manuscript Cover, terra cotta	91 06
2,500	sheets	18 x 31	40-lb. Manuscript Cover, opaline	70 15
497	sheets	20 x 25	60-lb. Wawona Cover, olive	13 56
28	sheets	20 x 25	60-lb. Kermes Cover, green	44
98	sheets	60-lb	Potomac Cover, crash finish	1 47
40	sheets	20 x 25	60-lb. Wawona Cover, blue	61
457	sheets	20 x 25	65-lb. Old Cloister Cover	15 53
63	sheets	22½ x 28½	75-lb. Pickwick Cover	1 48
16	sheets	22½ x 28½	75-lb. Middlesex Cover, green	21
344	sheets	22½ x 28½	80-lb. Interwoven Cover, antique finish, gray	9 41
256	sheets	22 x 28	80-lb. Greenway Cover, London smoke	5 12
57	sheets	22½ x 28½	90-lb. Princess Cover, purple	5 69
12	sheets	22½ x 28½	90-lb. Antique Princess Cover, gray	1 20
295	sheets	22½ x 28½	100-lb. Cabinet Cover, dark blue	13 28
14,900	sheets	25 x 33	124-lb. Smooth Grey Cover	565 60
1,892	sheets	40 x 48	200-lb. No. 1 Kraft	120 22
56	sheets	2-ply	Modern Cover, brown ripple	2 80

\$2,770 28

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

Cardboard.

1,965	sheets	22½ x 28½	2-ply white	bristol	-----	\$99 28
2,133	sheets	22½ x 28½	3-ply white	bristol	-----	102 33
8,229	sheets	22½ x 28½	4-ply white	bristol	-----	530 68
1,551	sheets	22½ x 28½	120-lb. 3-ply	colored bristol, yellow	-----	86 52
298	sheets	22½ x 28½	3-ply colored	bristol, grey	-----	11 97
432	sheets	22½ x 28½	3-ply	bristol board, green	-----	20 75
9	sheets	22½ x 28½	3-ply	bristol, pearl	-----	36
235	sheets	22½ x 28½	120-lb. 3-ply	colored bristol, salmon	-----	9 43
692	sheets	22½ x 28½	3-ply colored	bristol, blue	-----	35 94
536	sheets	22½ x 28½	3-ply colored	bristol, fawn	-----	25 94
322	sheets	22½ x 28½	3-ply colored	bristol, pink	-----	18 77
1,017	sheets	22½ x 28½	3-ply colored	bristol, cherry	-----	57 48
1,024	sheets	22½ x 28½	8-ply	blanks	-----	94 99
1,279	sheets	22½ x 28½	120-lb. iron	tag board	-----	51 85
138	sheets	22½ x 28½	160-lb. iron	tag board	-----	9 61
2,960	sheets	22½ x 28½	120-lb. tag	board	-----	60 16
2,080	sheets	140-lb.	Manila tag	board	-----	62 92
2,505	sheets	25½ x 30½	108-lb. blue	Acme index bristol	-----	161 21
748	sheets	25½ x 30½	110-lb. white	Gibraltar index bristol	-----	41 89
474	sheets	25½ x 30½	110-lb. buff	Gibraltar index bristol	-----	23 99
264	sheets	25½ x 30½	110-lb. cherry	Acme index bristol	-----	16 94
1,432	sheets	25½ x 30½	110-lb. salmon	Gibraltar index bristol	-----	72 46
3,153	sheets	25½ x 30½	140-lb. buff	Acme index bristol	-----	159 94
1,168	sheets	25½ x 30½	140-lb. R. & C.	index bristol	-----	91 45
1,849	sheets	140-lb.	blue index	bristol	-----	166 41
182	sheets	25½ x 30½	140-lb. R. & C.	index bristol, blue	-----	12 62
740	sheets	25½ x 30½	220-lb. blue	index bristol, Acme	-----	111 00
111	sheets	25½ x 30½	220-lb. linen	ledger buff bristol	-----	11 19
400	sheets	25½ x 30½	140-lb. Gibraltar	index bristol	-----	30 34
1,734	sheets	25½ x 30½	140-lb. Defiance	index bristol	-----	135 78
197	sheets	25½ x 30½	140-lb. Acme	index bristol, cherry	-----	14 95
35½	sheets	22½ x 28½	140-lb. 4-ply	index bristol, green	-----	1 19
58	sheets	220-lb.	Gibraltar index	bristol, blue	-----	8 33
503	sheets	25½ x 30½	220-lb. Acme	index bristol, salmon	-----	44 92
406	sheets	25½ x 30½	220-lb. Acme	index bristol, white	-----	36 26
172	sheets	25½ x 30½	170-lb. Gibraltar	index bristol, buff	-----	13 48
24	sheets	25½ x 30½	170-lb. Gibraltar	index bristol, white	-----	1 74
16	sheets	22 x 28	¾-ply tough	check, green	-----	88
241½	sheets	22½ x 28½	¾-ply tough	check, pearl	-----	13 27
709	sheets	22½ x 28½	¾-ply tough	check, red	-----	47 41
18½	sheets	22 x 28	4-ply tough	check, white	-----	1 20
7	sheets	22 x 28	4-ply tough	check, red	-----	46
1½	sheets	22 x 28	4-ply tough	check, opaline	-----	09
94	sheets	22½ x 28½	4-ply tough	check, yellow	-----	6 11
279	sheets	22½ x 28½	3-ply tough	check, green	-----	14 11
102	sheets	22 x 28	3-ply tough	check, pink	-----	5 19
230	sheets	22½ x 28½	3-ply tough	check, white	-----	11 70
335	sheets	22½ x 28½	3-ply tough	check, blue	-----	17 06
437½	sheets	22½ x 28½	3-ply tough	check, buff	-----	22 28
225	sheets	22½ x 28½	3-ply tough	check, yellow	-----	11 47
334	sheets	22½ x 28½	180-lb. tag	board	-----	8 08
173	sheets	22½ x 28½	100-lb. tag	board	-----	2 42
4	sheets	22½ x 28½	110-lb. tag	board	-----	03
16	sheets	22 x 28	china board, light	red	-----	48
80	sheets	22 x 28	china board, buff		-----	2 40
54	sheets	22 x 28	china board, yellow		-----	1 62
110	sheets	22 x 28	china board, salmon		-----	3 30
25	sheets	22 x 28	china board, dark	blue	-----	75
17	sheets	22 x 28	china board, pink		-----	51
28	sheets	22 x 28	china board, orange		-----	84
34	sheets	22 x 28	china board, blue		-----	1 02
3	sheets	22 x 28	china board, green		-----	09
791½	sheets	6-ply	railroad board, red		-----	75 37
151½	sheets	6-ply	railroad board, yellow		-----	5 12
159½	sheets	6-ply	railroad board, green		-----	5 38
226½	sheets	22 x 28	6-ply railroad	board, salmon	-----	7 65
83½	sheets	22 x 28	6-ply railroad	board, tea	-----	2 64
180½	sheets	22½ x 28½	6-ply railroad	board, coral	-----	6 07
75½	sheets	22 x 28	6-ply railroad	board, blue	-----	2 54

\$2,712 61

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

Flat Paper.

11,480	sheets 24 x 38 49-lb. Oakland, white	\$300 88
3,671	sheets 24 x 38 59-lb. Oakland, white	98 10
9,500	sheets 17 x 28 24-lb. Hamburg, white	82 08
4,205	sheets 17 x 28 25½-lb. Liberty, white	38 60
61,893	sheets 17 x 28 25½-lb. Palo Alto	685 63
270,317	sheets 17 x 28 30½-lb. Palo Alto	4,485 10
2,287	sheets 17 x 28 40½-lb. Palo Alto	46 69
35,182	sheets 22 x 34 40-lb. Palo Alto	612 17
20,604	sheets 22 x 34 48-lb. Palo Alto	430 01
7,178	sheets 28 x 34 61-lb. Palo Alto	288 30
1,264	sheets 17 x 22 16-lb. colored, green	4 92
2,998	sheets 17 x 22 16-lb. colored, canary	11 69
3,838	sheets 17 x 22 16-lb. colored, cherry	14 96
500	sheets 17 x 22 16-lb. colored, light blue	1 95
1,152	sheets 17 x 22 16-lb. colored, fawn	4 49
3,175	sheets 17 x 22 24-lb. colored, pink	33 97
6,031	sheets 17 x 22 24-lb. colored, dark blue	78 19
1,498	sheets 17 x 22 24-lb. colored, light blue	14 50
7,276	sheets 17 x 22 24-lb. colored, amber	90 29
5,587	sheets 17 x 22 24-lb. colored, green	80 95
1,609	sheets 17 x 22 24-lb. colored, cherry	15 59
3,977	sheets 17 x 22 24-lb. colored, fawn	51 56
11,142	sheets 17 x 22 24-lb. colored, canary	92 08
5,338	sheets 17 x 22 24-lb. colored, salmon	57 24
2,811	sheets 17 x 28 30½-lb. colored, canary	41 74
1,137	sheets 17 x 28 30½-lb. colored, salmon	14 63
594	sheets 17 x 28 32-lb. colored, azure	8 31
3,320	sheets 17 x 28 32-lb. colored, fawn	39 79
4,490	sheets 19 x 24 24-lb. colored, pink	51 19
1,458	sheets 19 x 24 28-lb. colored, Marguerite	8 09
52	sheets 19 x 24 28-lb. colored, pink	28
3,427	sheets 19 x 24 28-lb. colored, blue	19 03
5,300	sheets 17 x 28 30½-lb. colored, pink	93 87
22,995	sheets 22 x 34 40-lb. Carmel, white	389 06
7,442	sheets 17 x 28 30½-lb. Standard, blue	115 35
3,500	sheets 17 x 28 30½-lb. Standard, green	64 37
5,182	sheets 17 x 28 30½-lb. Standard, dark	76 79
4,656	sheets 22 x 34 48-lb. St. Charles, white	97 44
190,777	sheets 17 x 28 25½-lb. Albermarle, white	1,677 00
2,947	sheets 22 x 34 40-lb. Albermarle, white	39 50
		\$10,307 90

Envelopes.

575	No. 5 white envelopes	\$0 86
20,200	No. 6½ white envelopes	37 11
349,275	No. 6½ white envelopes	618 21
14,000	No. 7 white envelopes	38 20
7,650	No. 8 white envelopes	10 71
10,270	No. 9 white envelopes	45 61
293,045	No. 10 white envelopes	872 90
9,475	No. 11 white envelopes	51 85
12,325	No. 12 white envelopes	72 35
4,900	No. 14 white envelopes	23 98
115	No. 14 cloth lined envelopes	6 18
6,100	No. 5 Columbian Clasp Manila envelopes	20 41
2,375	No. 15 Columbian Clasp Manila envelopes	17 41
3,250	No. 20 Columbian Clasp Manila envelopes	22 66
62,750	No. 25 Columbian Clasp Manila envelopes	341 36
2,760	No. 30 Columbian Clasp Manila envelopes	40 03
3,588	No. 35 Columbian Clasp Manila envelopes	25 27
5,700	No. 40 Columbian Clasp Manila envelopes	20 92
6,000	No. 50 Columbian Clasp Manila envelopes	80 13
8,750	No. 55 Columbian Clasp Manila envelopes	95 86
10,000	No. 60 Columbian Clasp Manila envelopes	161 00
7,670	No. 63 Columbian Clasp Manila envelopes	86 63
465	No. 68 Columbian Clasp Manila envelopes	4 03
17,425	No. 75 Columbian Clasp Manila envelopes	299 30
3,900	No. 80 Columbian Clasp Manila envelopes	58 13
3,020	No. 90 Columbian Clasp Manila envelopes	112 33
4,957	No. 98 Columbian Clasp Manila envelopes	71 69

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

Envelopes—Continued.

998	No. 95 Columbian Clasp Manila envelopes	14 11
4,175	No. 97 Columbian Clasp Manila envelopes	69 31
38,000	No. 6½ Manila envelopes	47 50
92,475	No. 6½ Manila envelopes	206 71
9,000	No. 9 Manila envelopes	21 78
137,900	No. 10 Manila envelopes	399 03
194,500	No. 6½ Window envelopes	332 64
34,000	No. 10 white Outlook envelopes	197 33
5,985	No. 11 Manila envelopes	18 32
19,000	No. 12 Manila envelopes	72 12
1,140	No. 14 Manila envelopes	1 80
106,500	No. 6½ Manila Window envelopes	237 60
28,500	No. 10 Manila Window envelopes	93 43
8,500	No. 1 2½ x 3½ coin envelopes	5 86
10,250	No. 3 2½ x 4½ coin envelopes	10 92
9,975	No. 4½ 3 x 4½ coin envelopes	11 04
147,900	No. 19 6½ x 10 Improved Tension Clasp Manila envelopes	1,408 01
3,775	No. 19½ 7 x 10 Improved Tension Clasp Manila envelopes	36 47
58,489	No. 20 7 x 10½ Improved Tension Clasp Manila envelopes	605 25
6,974	No. 28 9 x 12 Improved Tension Clasp Manila envelopes	85 45
11,400	50-lb. 4½ x 7½ Manila Open End envelopes	20 41
17,650	50-lb. 6½ x 9½ Manila Open End envelopes	66 36
2,000	50-lb. 6½ x 10½ Manila Open End envelopes	7 24
4,400	50-lb. 7½ x 10½ Manila Open End envelopes	21 33
2,250	50-lb. 9½ x 12½ Manila Open End envelopes	17 02
4,400	No. 6½ Laid envelopes, blue	7 29
275	No. 6½ Laid envelopes, amber	33
2,325	No. 6½ 15-lb. Hickory Bond envelopes, blue	6 01
525	6½ 20-lb. Hickory Bond envelopes, white	1 31
700	No. 6½ California and Hickory Bond envelopes, white	1 56
400	No. 6½ Old Veda Bond envelopes, white	90
905	No. 10 Alexis Bond envelopes, blue, linen finish	5 03
4,500	No. 9 20-lb. Oak Bond envelopes	34 88
2,425	No. 10 English Bond envelopes, white	8 85
2,000	No. 6½ Brother Jonathan Bond envelopes	2 95
3,950	No. 11 Brother Jonathan Bond envelopes	16 75
2,400	No. 12 Brother Jonathan Bond envelopes	8 35
2,500	No. 6½ Brother Jonathan Bond envelopes, linen finish	4 67
500	No. 10 Brother Jonathan Bond envelopes, linen finish	1 79
200	6½ Alexis Bond envelopes	50
3,000	6½ Alexis Bond envelopes, blue	7 23
11,000	No. 6½ Standard Bond envelopes, R. F.	23 65
10,000	No. 10 Standard Bond envelopes, white	44 70
1,175	No. 10 Stratford Bond envelopes, white, linen finish	6 43
9,700	No. 6½ Saxon Bond envelopes, linen finish	14 77
275	No. 10 Saxon Bond envelopes	91
6,875	No. 11 National Bank Bond envelopes	18 90
175	No. 5 Baronial envelopes	25
0,125	No. 6 Imperial Parchment envelopes	27 37
75	No. 7 Baronial envelopes	11
1,000	No. 7 4½ x 7½ Baronial envelopes, white	2 14
125	4½ x 9½ Open End Cloth Lined envelopes	2 18
400	5½ x 7½ Wide Imperial envelopes	89
500	5½ x 8½ No. 6 Scarf Open End Manila envelopes	2 09
10,000	No. 3 50-lb 7 x 10 Manila Catalogue Open End envelopes	44 05

\$7,535 19

Linen Paper.

2,465	sheets 17 x 22 20-lb Ardmore Linen	\$17 75
235	sheets 19 x 24 24-lb. Savoy Linen	1 60
82	sheets 17 x 22 18-lb. Imperial Parchment Linen	79
460	sheets 19 x 24 24-lb. Imperial Parchment Linen	5 52
3,190	sheets 24 x 38 48-lb. Imperial Parchment Linen	172 56

\$198 31

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

Shipping Tags.

47,000	No. 8 E C red tags	955 96
3,000	No. 7 E Manila shipping tags	3 10
3,500	No. 6 C X Cloth shipping tags	21 87
6,100	No. 6 G Manila shipping tags	13 34
3 230	No. 5 E Manila shipping tags	5 09
7,000	No. 5 G Manila shipping tags	8 19
		<hr/> \$147 55

Textbook Paper.

152,686	sheets 31 x 42 50-lb. Textbook	\$3,496 57
748,000	sheets 31 x 46 90-lb. Textbook	13,841 62
78 270	sheets 34 x 51 100-lb. Textbook	2,086 55
49,600	sheets 33 x 50 104-lb. Textbook	1,300 10
28,433	sheets 23 x 31 heavy brown Cover (Duplex)	1,791 27
4 140	sheets 23 x 31 double thick brown Antique Buckeye Cover	377 57
		<hr/> \$22,895 96

Miscellaneous.

2,956	sheets 17 x 28 National Safety Paper, blue	\$69 34
407	sheets 17 x 28 National Safety Paper, green	12 24
4,130	sheets 17 x 28 National Safety Paper, primrose	118 52
3,093	sheets 17 x 28 Bankers Safety Paper, stone	74 24
3,682	sheets 17 x 28 National Safety Paper, pink	88 95
419	sheets 17 x 28 National Safety Paper, stone	10 13
1,740	sheets 17 x 22 16-lb. Mimeograph Paper	9 47
6,793	sheets 20 x 26 glazed paper, assorted colors	73 56
2,395	sheets 20 x 30 grass bleached tissue, silver	8 65
5,247	sheets 17 x 22 non-curl gum paper, white	84 82
3,442	sheets 20 x 25 non-curl gum paper, assorted colors	28 98
12	sheets 5 x 8 genuine parchment	3 27
1 217	sheets Typewriter Onion Skin, 17 x 22	4 60
2,470	sheets 17 x 22 Franklin Onion Skin	9 52
4 355	sheets 17 x 22 No. 1 French Folio, blue	21 95
963	sheets 17 x 22 French Folio, cherry	3 71
9,900	sheets 17 x 22 French Folio, unglazed cherry	38 14
963	sheets 17 x 22 French Folio, glazed green	3 72
6,550	sheets 17 x 22 French Folio, unglazed white	25 24
1,389	sheets 17 x 22 8-lb. French Folio, unglazed yellow	5 36
1,977	sheets 17 x 22 French Folio, unglazed green	7 62
4,234	sheets No. 1 French Folio, unglazed pink	16 31
1,217	sheets No. 1 17 x 28 French Folio, unglazed blue	7 37
7,450	sheets 17 x 28 10-lb. French Folio, unglazed pink	40 97
4,570	sheets 17 x 28 No. 1 French Folio, unglazed canary	32 90
1,280	sheets 19 x 24 No. 1 French Folio, tissue paper	4 47
2,000	sheets 22 x 34 No. 1 French Folio, glazed white	14 21
7,500	sheets 22 x 34 No. 1 French Folio, unglazed white	65 55
2,500	sheets 22 x 34 No. 1 French Folio, green	27 90
161	sheets 17 x 22 No. 56 Cranes Artificial Parchment	11 47
		<hr/> \$923 27

Manila Paper.

2,294	sheets 17 x 28 20-lb. Chemical, blue	\$9 91
12,809	sheets 17 x 28 20½-lb. Chemical, pink	74 47
3,570	sheets 17 x 28 20½-lb. Chemical, blue	20 08
8,857	sheets 17 x 28 20½-lb. Chemical, yellow	38 21
5,021	sheets 17 x 28 28-lb. Chemical, white	35 15
345	sheets 19 x 24 24-lb. Chemical, yellow	2 53
41,875	sheets 22 x 34 32-lb. Chemical, white	383 83
6,808	sheets 22 x 34 32-lb. Chemical, pink	54 49
1,574	sheets 22 x 34 32-lb. Chemical, blue	23 38
53,193	sheets 22 x 34 32-lb. Chemical, yellow	549 13
5,351	sheets 22 x 34 40-lb. Chemical, pink	35 16
2,990	sheets 22 x 34 40-lb. Chemical, white	32 84
1,470	sheets 24 x 38 39-lb. Chemical, yellow	22 19
27,278	sheets 28 x 34 41-lb. Chemical, white	266 04
7,748	sheets 36 x 48 200-lb. Jute	237 81
6,049	sheets 40 x 48 150-lb.	196 37
		<hr/> \$1,981 59

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

Ledger Paper.

818	sheets	19 x 48	88-lb.	Defiance, white	\$46 07
50	sheets	30 x 28	54-lb.	Defiance, buff	1 32
760	sheets	16 x 21	20-lb.	Brown's	11 87
10	sheets	19 x 24	44-lb.	Brown's	35
25	sheets	17 x 28	40½-lb.	A Z & S, buff	60
1,203	sheets	19 x 24	44-lb.	Scotch Ledger	26 75
2,308	sheets	20 x 28	54-lb.	Scotch Ledger, white	121 30
2,628	sheets	24 x 38	88-lb.	Scotch Ledger, white	198 39
1,000	sheets	19 x 24	44-lb.	Weston's white	34 10
272	sheets	20 x 28	54-lb.	Weston's	11 96
237	sheets	23 x 31	72-lb.	Weston's, white	16 53
3,455	sheets	22 x 34	56-lb.	Hammermill, buff	118 41
290	sheets	28 x 34	71-lb.	Hammermill, white	11 85
2,544	sheets	17 x 28	40½-lb.	Vulcan, buff	76 24
432	sheets	24 x 28½	52-lb.	Vulcan, white	11 46
858	sheets	24 x 38	68½-lb.	Vulcan, buff	46 24
831	sheets	20 x 28	54-lb.	Mills, buff	17 41
23	sheets	24 x 38	88-lb.	Mills, white	1 19
5,951	sheets	17 x 28	40½-lb.	Resolute, white	144 61
12,500	sheets	21 x 32	57-lb.	Resolute, white	362 28
312	sheets	24 x 36	80-lb.	Resolute, buff	16 97
2,487	sheets	24 x 38	68-lb.	Resolute, white	101 47
2,132	sheets	21 x 32	57-lb.	Tisrite, white	85 28
3,475	sheets	21 x 32	57-lb.	Tisrite, blue	160 44
210	sheets	23 x 36	71-lb.	Tisrite, white	8 95
2,152	sheets	23 x 36	80-lb.	Tisrite, white	125 85
332	sheets	24 x 38	88-lb.	Tisrite, blue	46
1,180	sheets	17 x 28	40½-lb.	Reliance, blue	32 23
488	sheets	17 x 28	40½-lb.	Reliance, buff	13 17
8,214	sheets	17 x 22	28-lb.	Reliance, white	178 40
6,736	sheets	21 x 32	57-lb.	Reliance, blue	294 56
1,237	sheets	21 x 32	57-lb.	Reliance, buff	50 76
4	sheets	19 x 48	88-lb.	Reliance, white	01
3,996	sheets	20 x 28	54-lb.	Reliance, white	123 00
2,643	sheets	22 x 34	64-lb.	Reliance, blue	137 49
4,097	sheets	22 x 34	64-lb.	Reliance, buff	210 29
4,432	sheets	23 x 31	68½-lb.	Reliance, white	225 57
3,500	sheets	23 x 36	71-lb.	Reliance, white	192 34
3,229	sheets	23 x 36	71-lb.	Reliance, blue	185 70
1,243	sheets	24 x 28½	51-lb.	Reliance, buff	47 28
1,750	sheets	24 x 38	88-lb.	Reliance, buff	75 63
1,390	sheets	24 x 38,	No. 28, 68-lb.	Reliance, blue	57 71
1,786	sheets	24 x 38	88-lb.	Reliance, white	113 47
8,500	sheets	16 x 21	28½-lb.	Pacific, white	156 98
1,199	sheets	17 x 28	40½-lb.	Pacific, white	31 46
16,075	sheets	21 x 32	57-lb.	Pacific, blue	627 71
13,823	sheets	21 x 32	57-lb.	Pacific, white	543 00
12,588	sheets	21 x 32	57-lb.	Pacific, buff	497 10
8,427	sheets	23 x 36	71-lb.	Pacific, white	336 58

\$5,880 07

Bond Paper.

3,750	sheets	17 x 22	16-lb.	white Agawam	\$31 80
50	sheets	17 x 28	24-lb.	white Agawam	81
73	sheets	17 x 28	16½-lb.	white Agawam	247 02
125	sheets	22 x 30	40-lb.	white Agawam	2 33
25	sheets	17 x 28	16½-lb.	Bank, white	37
5,468	sheets	22 x 34	32-lb.	Bank, green	121 17
2,851	sheets	22 x 34	32-lb.	Bank, green	55 62
7,928	sheets	22 x 34	40-lb.	Bank, white	187 06
834	sheets	24 x 38	40-lb.	Bank, blue	7 35
110	sheets	17 x 22	16-lb.	National Bank, primrose	1 48
3,900	sheets	17 x 28	20½-lb.	National Bank, russet	53 86
3,449	sheets	17 x 28	25½-lb.	National Bank, yellow	43 93
775	sheets	22 x 34	26-lb.	National Bank, buff	13 53
163	sheets	25 x 38	40-lb.	National Bank, blue	1 53
483	sheets	22 x 34	24-lb.	Bay Path Bond, pink	10 49
3,160	sheets	22 x 34	24-lb.	Bay Path Bond, golden rod	69 96
3,160	sheets	22 x 34	24-lb.	Bay Path Bond, blue	66 35
1,261	sheets	17 x 28	20½-lb.	California Bond, golden rod	16 01

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

308	sheets	22 x 34	32-lb.	California Bond, buff	6 27
2,309	sheets	22 x 34	40-lb.	California Bond, blue	63 20
4,029	sheets	22 x 34	40-lb.	California Bond, buff	95 74
4,192	sheets	22 x 34	32-lb.	California Bond, primrose	56 56
1,588	sheets	24 x 38	39-lb.	California Bond, pink	36 80
2,535	sheets	17 x 18	20½-lb.	Certificate Bond, green	31 59
23,720	sheets	17 x 28	20½-lb.	Certificate Bond, canary	271 37
9,335	sheets	17 x 28	20½-lb.	Certificate Bond, white	120 37
8,816	sheets	17 x 28	20½-lb.	Certificate Bond, pink	84 36
18,638	sheets	19 x 24	24½-lb.	Certificate Bond, white	194 11
1,038	sheets	22 x 34	32-lb.	Certificate Bond, buff	14 78
58,039	sheets	22 x 34	32-lb.	Certificate Bond, white	799 58
104,865	sheets	22 x 34	40-lb.	Certificate Bond, white	1,925 87
13,140	sheets	22 x 34	32-lb.	Certificate Bond, pink	223 90
15,620	sheets	22 x 34	32-lb.	Certificate Bond, blue	234 57
5,390	sheets	24 x 38	39-lb.	Certificate Bond, white	96 18
5,000	sheets	17 x 28	20½-lb.	Columbia Bond, gray	54 84
3,675	sheets	17 x 28	20½-lb.	Columbia Bond, buff	40 53
4,348	sheets	22 x 34	25-lb.	Columbia Bond, white	74 44
22	sheets	17 x 22	16-lb.	Community Bond, buff	10
2,020	sheets	17 x 28	24-lb.	Community Bond, green	19 40
45	sheets	17 x 28	24-lb.	Community Bond, blue	43
20	sheets	17 x 28	24-lb.	Coupon Bond, coffee	23
185	sheets	17 x 22	21-lb.	Cranes Bond, blue	4 33
2,981	sheets	17 x 22	21-lb.	Cranes Bond, white	65 88
388	sheets	17 x 22	No. 25,	Cranes Bond, white	10 47
450	sheets	17 x 28	No. 25,	Cranes Bond, white	15 39
200	sheets	17 x 28	No. 21,	Cranes Bond, pink	4 08
3,880	sheets	17 x 28	No. 21,	Cranes Bond, white	87 24
875	sheets	19 x 24	No. 25,	Cranes Bond, white	20 37
632	sheets	19 x 24	No. 21,	Cranes Bond, white	13 27
21,633	sheets	22 x 34	32-lb.	Dello Colored Bond, pink	239 71
796	sheets	22 x 34	32-lb.	Dello Colored Bond, blue	9 04
4,790	sheets	17 x 28	20½-lb.	English Bond, primrose	63 62
210	sheets	17 x 28	20-lb.	English Bond, tuscan	93
3,992	sheets	17 x 28	20½-lb.	English Bond, opaline	53 04
7,500	sheets	17 x 28	20½-lb.	English Bond, golden rod	102 45
407	sheets	17 x 28	20½-lb.	English Bond, buff	4 91
722	sheets	17 x 28	20½-lb.	English Bond, blue	9 74
14,225	sheets	22 x 34	32-lb.	English Bond, opaline	38 76
615	sheets	22 x 34	40-lb.	English Bond, opaline	15 43
2,631	sheets	22 x 34	40-lb.	English Bond, pink	53 78
6,750	sheets	22 x 34	40-lb.	English Bond, blue	170 10
378	sheets	22 x 34	24-lb.	English Bond, blue	6 69
2,770	sheets	22 x 34	32-lb.	English Bond, cherry	46 02
371	sheets	22 x 34	24-lb.	English Bond, golden rod	7 89
2,761	sheets	22 x 34	40-lb.	English Bond, buff	48 06
611	sheets	22 x 34	32-lb.	English Bond, golden rod	12 34
1,536	sheets	22 x 34	32-lb.	English Bond, gray	20 65
4,320	sheets	22 x 34	24-lb.	English Bond, buff	97 02
3,716	sheets	22 x 34	24-lb.	English Bond, canary	74 66
4,857	sheets	28 x 34	32-lb.	English Bond, canary	99 62
16	sheets	22 x 34	32-lb.	English Bond, pink	30
2,778	sheets	22 x 34	40-lb.	English Bond, canary	65 95
218	sheets	24 x 38	39-lb.	English Bond, pink	4 17
2,277	sheets	24 x 38	39-lb.	English Bond, buff	52 04
960	sheets	24 x 38	39-lb.	English Bond, blue	21 94
5,083	sheets	24 x 38	39-lb.	English Bond, canary	112 38
3,437	sheets	22 x 34	40-lb.	Excelsior Bond, white	43 72
58	sheets	22 x 34	32-lb.	Excelsior Bond, white	62
3,443	sheets	28 x 34	51-lb.	Excelsior Bond, white	55 73
1,408	sheets	28 x 34	33-lb.	Exchange Bond, white	44 30
92	sheets	17 x 22	20-lb.	Fairfield Parchment, white linen finish	1 10
153	sheets	22 x 34	32-lb.	Hammermill Bond, primrose	2 73
3,720	sheets	22 x 34	32-lb.	Hammermill Bond, russet	57 85
1,725	sheets	22 x 34	32-lb.	Hammermill Bond, russet	26 82
■	sheets	17 x 22	20-lb.	Hickory Bond, blue	04
12,495	sheets	17 x 28	20½-lb.	Marine, blue	165 98
4,676	sheets	17 x 22	13-lb.	Mercantile Bond, white	63 96
1,750	sheets	22 x 34	16-lb.	Mercury Manifold Bond, white	28 35

INVENTORY, 1919-1920: JUNE 30, 1920—Continued.

24,145	sheets 22 x 34 32-lb. Messenger, blue	319 10
6,220	sheets 22 x 34 40-lb. Nibroc Bond, white	74 39
7,338	sheets 22 x 34 40-lb. Oak Bond, green	240 67
53,058	sheets 22 x 34 32-lb. Optimo Bond, white	507 67
10,649	sheets 22 x 34 32-lb. Optimo Bond, canary	123 07
7	sheets 17 x 28 25½-lb. Orient Bond, white	10
8,000	sheets 22 x 34 32-lb. Orient Bond, buff	165 89
500	sheets 25 x 38 40-lb. Orient Bond, white	9 53
175	sheets 17 x 22 20-lb. Reliance Bond, primrose	84
42	sheets 17 x 22 20-lb. Reliance Bond, green	21
80	sheets 19 x 24 20-lb. Reliance Bond, blue	38
10,000	sheets 22 x 34 32-lb. Reliance Bond, golden rod	270 72
253	sheets 24 x 38 40-lb. Reliance Bond, buff	4 33
3,725	sheets 17 x 28 25½-lb. Standard Bond, pink	67 26
4,065	sheets 17 x 28 25½-lb. Standard Bond, blue	97 12
6,914	sheets 17 x 28 25½-lb. Standard Bond, buff	148 04
3,030	sheets 17 x 28 20½-lb. Standard Bond, white	42 48
804	sheets 19 x 24 20-lb. Standard Bond, opaline	4 82
475	sheets 19 x 24 16-lb. Standard Bond, white	7 23
5,839	sheets 28 x 42 40-lb. Map Bond, white	231 24
2,046	sheets 17 x 22 10-lb. Strathmore Bond, white	25 37
58	sheets 17 x 28 No. 21, Strathmore Bond, white	73
9,835	sheets 17 x 28 10-lb. Superior Manifold, white	97 10
245	sheets 17 x 28 10-lb. Superior Manifold, blue	1 47
3,715	sheets 17 x 22 8-lb. Superior Manifold, blue	33 42
19,886	sheets 17 x 22 8-lb. Superior Manifold, white	161 07
185	sheets 17 x 22 28-lb. Telianan Ex Super Bond, blue	2 79
1,033	sheets 17 x 22 20-lb. Tisrite Linen Finish, white	15 01
758	sheets 17 x 22 20-lb. Tisrite Linen Finish, blue	8 80
440	sheets 17 x 22 20-lb. Tisrite Linen Finish, golden rod	5 10
2,555	sheets 17 x 22 16-lb. Tisrite Linen Finish, russet	22 48
2,720	sheets 17 x 28 16½-lb. Tisrite, Regular, white	43 17
2,711	sheets 22 x 34 40-lb. Tisrite Linen Finish, golden rod	62 90
804	sheets 22 x 34 40-lb. Tisrite, opaline	13 38
2,440	sheets 22 x 34 40-lb. Tisrite, blue	53 61
2,565	sheets 22 x 34 40-lb. Tisrite, corn	59 52
3,016	sheets 22 x 34 40-lb. Tisrite Linen Finish, white	77 94
4,864	sheets 22 x 34 32-lb. Tisrite, blue	90 28
618	sheets 22 x 34 32-lb. Tisrite, pink	106 79
265	sheets 22 x 34 32-lb. Tisrite, golden rod	6 74
1,694	sheets 22 x 34 32-lb. Tisrite, opaline	28 19
470	sheets 22 x 34 40-lb. Trust Bond, buff	3 76
2,185	sheets 22 x 34 32-lb. Trust Bond, peach	31 55
196	sheets 25 x 38 51-lb. Trust Bond, white	5 17
149	sheets 17 x 22 16-lb. Yosemite Bond, white	81

\$10,798 86

Ruled Paper.

160	Ruled Department Analysis Master Sheets, Form 11A	\$4 04
57	Appropriation Ledger Master Sheets	1 21
1,579	Check Register Master Sheets	27 47
1,372	Check Register Fly Sheets	13 73
460	District Ledger Fly Sheets	6 21
885	Cash Received Sheets	13 27
595	Ruled Stockholders' Record Book Blanks	13 99
290	17 x 22 20-lb. Imperial Parchment Linen	2 80
400	14 x 19 14-column ruled paper	7 77
5,600	17 x 28 32-lb. Committee ruled blanks	18 96
365	17 x 28 35-lb. Pacific Coast legislative desk ruled	3 40
880	17 x 28 32-lb. Standard legal ruled blanks	10 07
375	17 x 22 20-lb. Ardmore Linen (ruled letter heads)	3 45
695	17 x 28 Legal ruled paper, Oakland and Palo Alto	10 48
116	17 x 28 28-lb. Carmel ruled bill heads	1 35
46	17 x 28 32-lb. Standard Flat bill heads, ruled	46

\$138 71

BINDERY STOCK INVENTORY—JUNE 30, 1920.

Book Cloth.

19,691	yards XT41 gray	\$9,073 81
2,000	yards X23 dark olive green	720 00
35,033	yards Rex T50 dark brown	9,564 01
34,513	yards XT1½ gray brown	10,451 76
4,802	yards XT9 red brown	1,043 55
1,478	yards De Lux T48 red brown	460 63
1	roll 1½-inch black gum Holland	2 40
2	rolls ¾-inch black gum Holland	2 40
1	roll 1-inch black gum Holland	1 80
566	roll's 1-inch white gum Holland	799 12
496	rolls ¾-inch brown gum Holland	455 47
127	yards linen weave—purple cloth No. 236	46 99
38	rolls dark green (state) 420 yards \$7.90	300 20
34	yards blue cloth (linen weave)	7 29
1,276	yards No. 10 gray buckram	274 08
55	yards blue book silk cloth	11 79
70	yards book cloth, yellow brown	8 76
25	yards book cloth, brown	7 87
192	rolls old gray cover cloth	1,094 40
34	rolls old green cover cloth	238 60
127	yards robins egg blue book cloth T 10	15 89
30	rolls cover cloth, assorted colors	237 90
544	yards T No. 48 book cloth, red brown	169 54
920	yards XT22 brown cloth	115 09
3,005	yards T38 red cloth	375 93
21	yards white oil cloth	9 85
213½	yards brown corduroy	203 06
25	yards blue silk basket cloth No. 72	13 75
200	yards light brown basket weave cloth	42 96
20	yards black silk finish linen weave cloth	4 29
68½	yards corduroy	65 31
200	yards book cloth (assorted colors)	42 56
376	yards T28½ brown vellum	118 44
76½	yards light blue gingham	27 35
40	yards art canvas (P) green	19 20
487½	yards Blue Star muslin	83 27
1,406½	yards flannelette	351 62
400	yards book cloth, pebble grain	67 70
1,050	yards book cloth, pebble grain	177 76
1,200	yards book cloth, shot	203 16
117	yards blue buckram No. 7	79 56
120	yards green buckram No. 92	108 00
50½	yards brown buckram	34 34
125	yards brown imported buckram	125 00
40	yards art canvas (P2)	19 20
61	yards red buckram	23 48
640	yards assorted buckram	307 20
101	yards brown duck canvas	41 41
2,026	yards white duck canvas	383 93
40	yards dark blue art canvas	14 40
40	yards light blue art canvas	14 40
219½	yards blue duck canvas	51 58
161½	yards cotton flannel	46 23
250	yards assorted cloths	50 00
5	yards red silk	7 84
112	yards gold silk	164 30
3,508	yards super lining	359 57
8,400	yards gum muslin, 2-inch	75 56
8,700	yards gum muslin, 1½-inch	56 38
364	yards Indian Head muslin, 54-inch	216 58
985½	yards Indian Head muslin, 44-inch	438 55

\$37,456 89

BINDERY STOCK INVENTORY—JUNE 30, 1920—Continued.

Miscellaneous.

3½	packs gold leaf	\$45 67
2	packs gold leaf, pale 5 x 5.....	10 00
3	cotton batting	45
132	yards silk head bands	2 64
3	quarts liquid glue	1 94
67	yards Portland guards	2 18
180	yards Fenwick stay binding, black	1 29
2	yards pantasote (auto top)	4 00
8,000	flags for Brief History or Civics.....	19 40
9½	sheets wadding for binding portfolios.....	76
7,920	yards ½-inch white tape	118 80
20,000	white metal eyelets (A168).....	4 15
10,000	black metal eyelets (A175).....	5 05
473	bookform card cases	14 19
24	bars of Car-mu-cha	14 40
507	celluoid fasteners, black	7 40
1,987	celluoid fasteners, maroon	29 01
		<hr/>
		\$281 33

Paper.

8	quires rag lining paper, 150-lb. 36 x 48.....	\$2 72
153	rolls 1-inch case back lining paper (O) 2-lb.....	26 01
912	rolls 1½-inch case back lining paper (N) 2-lb.....	273 60
227	rolls 1½-inch case back lining paper (O) 3-lb.....	57 88
329	rolls 2-inch case back lining paper (O) 3½ lb.....	97 87
102	rolls 2½-inch case back lining paper (O) 4-lb.....	34 68
6	rolls 3-inch case back lining paper (O)	2 55
5,000	sheets 40 x 48 150-lb. Kraft paper	149 61
310	reams 23 x 40 63-lb. Kraft paper	1,680 20
2 250	sheets 25 x 38 80-lb. rough lining paper	61 56
1,961	sheets gray German marble paper.....	39 64
900	sheets green German marble paper.....	18 19
256	sheets fancy marble paper, large combination.....	5 18
200	sheets fancy marble paper, fine combination.....	4 04
5,250	sheets American marble paper	106 74
2,880	sheets green marble paper	58 22
492	sheets tan marble paper	9 95
805	sheets green marble paper	16 27
564	sheets blue and tan marble paper.....	11 40
3 456	sheets chocolate lining paper	28 80
		<hr/>
		\$2,685 11

Loose Leaf Binders and Parts.

1,100	index tab stays	\$1 70
38	sets Langs No. 2½ index tabs	7 60
401	sets No. 15 and 16 Gothic index tabs.....	14 92
13	sets index tabs, celluloid	5 20
216	library titles (court records).....	21 66
62	pieces tab stock for index tabs (30-801).....	16 74
29	Stockholders' Record books (52 p.).....	27 93
87	Stockholders' Record books (26 p.).....	52 20
385	rubber tips	11 55
1	500p. minute book	11 00
4	14-inch Baker-Vawter binder metals.....	25 85
1	12-inch Baker-Vawter binder metals.....	6 43
1	De Lux metal ledger back	10 00
1	100-page check register	21 71
27	side labels for binders.....	1 35
26	end lock binder metals, 22-inch.....	24 70
41	end lock binder metals, 16-inch.....	36 90
10	end lock binder metals, 16-inch with side posts.....	12 50
29	top lock binder metals, 8-inch.....	21 75
20	top lock binder metals, 9-inch.....	18 00
76	top lock binder metals, 16-inch.....	91 20
71	brown cloth covers, letter size.....	16 12
17	Department Analysis binders No. 36255.....	75 05
17	sets special index tabs (made at State Printing Office).....	17 00
		<hr/>
		\$549 06

BINDERY STOCK INVENTORY—JUNE 30, 1920—Continued.

Cardboards.

27	sheets .012 tan stencil board	\$5 14
19	sheets .016 tan stencil board	5 32
33	sheets .020 tan stencil board	12 54
71	bundles No. 20 26 x 38 straw board	303 88
28	bundles No. 30 24 x 28 tar board	128 80
10	bundles No. 20 27 x 32 tar board	11 33
2	bundles No. 20 25½ x 32 tar board	4 75
997	bundles No. 22 23 x 31½ tar board	2,123 43
62	bundles No. 20 22 x 28 Davy tar board	209 99
31	bundles No. 25 24 x 38 Davy tar board	57 29
185	bundles .038 chip board, 26 x 38	376 94
		<hr/>
		\$3,239 41

Inks.

25	pounds No. 63 bookbinders' gloss, brown	\$31 25
10	pounds No. 63 bookbinders' gloss, black	12 50
4	pounds No. 282 bookbinders' gloss, red	7 00
30	pounds bookbinders' gloss, blue	45 00
15	pounds bookbinders' gloss, yellow	18 75
15	pounds bookbinders' gloss, orange	11 10
42	pounds bookbinders' gloss, green	63 00
		<hr/>
		\$188 00

Leather.

144½	feet red cowhide No. 2	\$82 51
169	feet black cowhide No. 2	59 15
124	feet red cowhide No. 1	48 36
10	yards red imitation leather	13 00
156	feet red buffing	46 50
64	feet green water grain buffing	9 70
26	feet black water grain buffing	9 10
81	feet black buffing	24 30
15	skins tit'e leather, red	19 69
9	skins title leather, blue	7 33
1	skin title leather, green	81
1	skin seal grain, black	2 10
23	skins heavy skivers	19 06
46	skins skivers	71 56
7	feet Oasis morocco, purple	2 16
33	feet Oasis morocco, red	10 19
45	feet Oasis morocco, black	13 89
637	feet Oasis morocco, maroon	364 63
64	feet Oasis morocco, black	44 18
35	feet Oasis morocco, turkey red	9 15
23	feet Oasis morocco, blue	7 32
277	feet Oasis morocco, green	72 45
370	feet Oasis morocco, light brown	98 77
		<hr/>
		\$1,033 89

Wire.

1,008	spools wire, assorted sizes	\$907 20
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INVENTORY OF INKS—PRESSROOM: JUNE 30, 1920.

750	pounds book black	-----	\$187 50
308	pounds halftone	-----	154 00
152	pounds halftone black	-----	114 00
14	pounds policy black	-----	9 10
10	pounds process black	-----	9 00
25	pounds job black	-----	16 25
10	pounds job black	-----	7 50
5	pounds orange lake	-----	5 50
10	pounds Utor brown	-----	10 00
26	pounds poster red	-----	10 40
5	pounds job purple	-----	7 50
3	pounds white cover	-----	2 70
6	pounds blue lake	-----	9 00
8	pounds rose lake	-----	14 00
25	pounds lakatin	-----	10 00
10	pounds Oxford Bible	-----	4 00
16	pounds Milori blue	-----	14 40
5	pounds poster red	-----	2 50
9	pounds light green	-----	11 25
16	pounds lemon yellow	-----	12 00
10	pounds dark green	-----	12 50
10	pound Sienna brown	-----	7 00
4	pounds light brown lake	-----	3 00
25	pounds lemon yellow	-----	16 25
3	pounds rose lake	-----	5 25
2	pounds red copy	-----	7 00
1	pound gold ink	-----	3 50
1	pound scarlet red	-----	2 25
2	pounds process red	-----	3 20
2	pounds Madder lake	-----	3 00
1	pound bronze blue	-----	1 25
3	pounds copy purple	-----	8 50
1	pound letter head blue	-----	1 35
4	pounds policy black	-----	2 60
1	pound job white	-----	60
1	pound lemon yellow	-----	75
1	pound olive green	-----	1 25
4	pounds poster red	-----	1 60
5	pounds Milori blue	-----	4 50
1	pound photo brown	-----	1 00
2	pounds brown lake	-----	3 00
1	pound job purple	-----	1 50
1	pound bond blue	-----	1 50
1	pound chromatic blue	-----	1 50
1	pound process blue	-----	1 35
1	pound ultra blue	-----	1 00
1	pound orange lake	-----	1 75
2	pounds dark green	-----	2 50

 \$711 07

REPORT OF FISCAL YEAR

1918-1919

SUMMARY OF PAY ROLLS BY MONTHS.

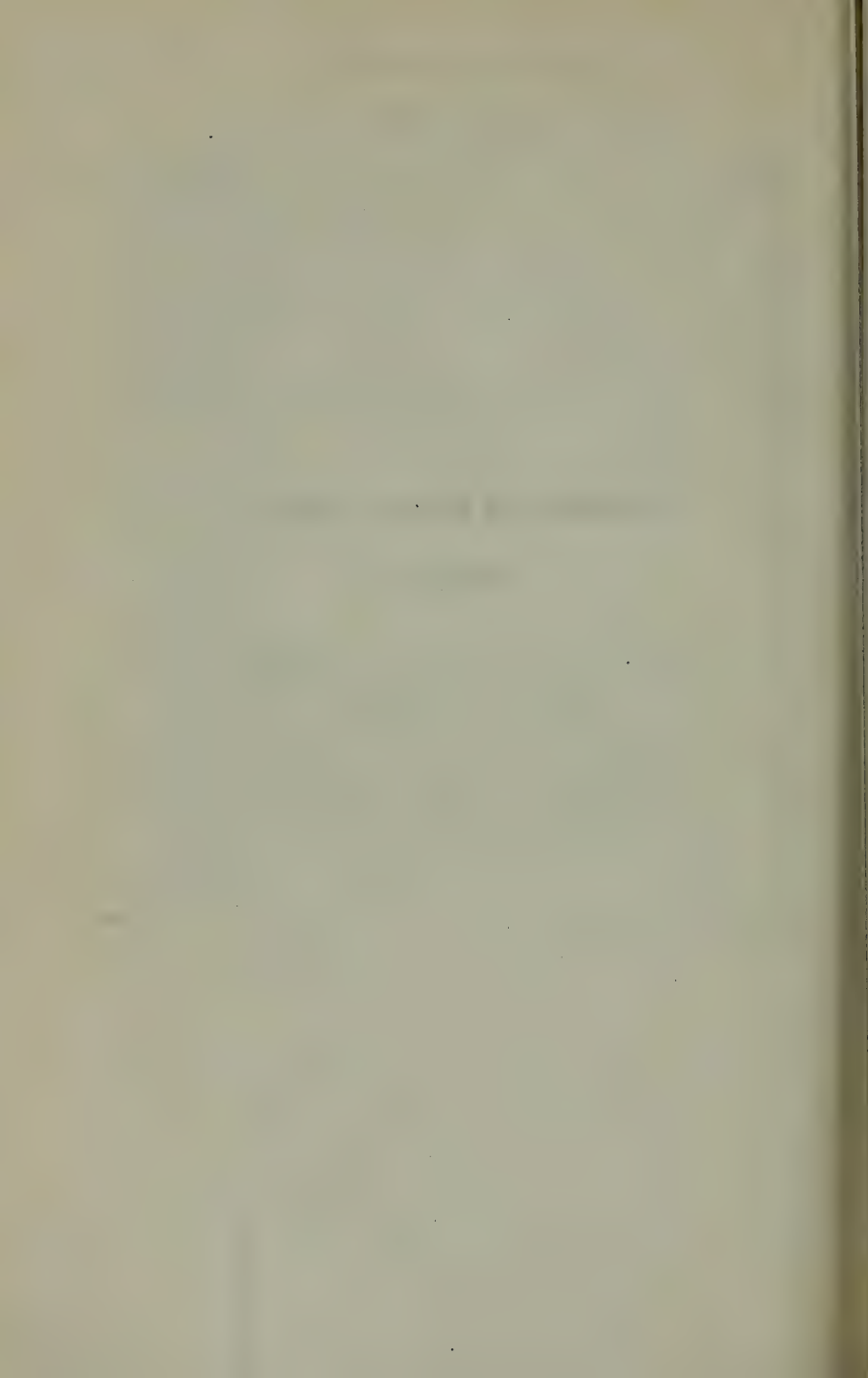
EQUIPMENT PURCHASED.

ABSTRACT OF ACCOUNTS RECEIVABLE.

ABSTRACT OF ACCOUNTS PAYABLE.

SUMMARY OF STOCK PURCHASED.

INVENTORY OF STOCK ON HAND.



PAY ROLLS BY MONTHS.

Fiscal Year, July 1918, to July 1919.

1918—		
July	-----	\$16,678 35
August	-----	17,464 05
September	-----	19,218 65
October	-----	18,260 25
November	-----	16,746 20
December	-----	18,022 20
1919—		
January	-----	26,612 65
February	-----	18,919 70
March	-----	20,703 26
April	-----	26,878 09
May	-----	16,982 35
June	-----	16,285 80
		<hr/>
		\$238,721 55

EQUIPMENT PURCHASES FROM PRINTING FUND.

Fiscal Year 1918-1919.

3	all brass galleys, 12 x 18.....	\$20 17
2	United States flag cuts, No. 6002.....	1 15
2	dozen Ooe's all steel handled wrenches.....	4 00
3	eccentric straps for tab cutting attachment.....	7 50
	New Perfection heaters No. 560.....	24 53
1	pasteur for second fold (16-page pasting attachment).....	325 00
1	Utica pier.....	1 85
24	Beehive X-ray reflectors No. 570.....	31 32
24	shade holders.....	3 65
1	Liberty Junior sealing machine.....	1 50
6	chases 10 x 15 C. and P., steel electro welded.....	36 00
4	fonts 24-point Caslon lightface Keystone.....	19 25
		<hr/>
		\$475 92

MACHINERY PURCHASES FROM APPROPRIATION MADE BY LEGISLATURE.

Fiscal Year 1918-1919.

2	16-inch, 6-blade, 110-volts, oscillating electric fans.....	\$54 78
1	13 Clipper belt lacer.....	20 00
1	Miller platen press feeder.....	750 00
1	Miller pump.....	
1	tab cutting attachment with 2 blades.....	175 00
	Burroughs adding machine No. 43416.....	154 35
1	Overland model 83, delivery truck No. 1927.....	\$1,243 95
	Less allowance for old car.....	325 00
		<hr/>
		918 95
1	pair 12 inch cutting blades, style N.....	58 10
	Universal folding machine.....	175 00
		<hr/>
		\$2,306 18

ACCOUNTS RECEIVABLE AS OF JUNE 30, 1919.

Agricultural Society	\$142 97
Attorney General	157 61
Adjutant General	54 60
Adjutant General—High School Cadets	47 98
Banking Department	2,757 47
Bureau of Criminal Identification	3 35
Bureau of Labor Statistics—Public Employment	236 62
Bureau of Labor Statistics	195 86
Board of Charities and Corrections	150 38
Board of Control	382 47
Board of Control—Salary and Support of Children's Agents	392 07
Board of Dental Examiners	164 20
Board of Education	10 93
Board of Education—Vocational Educational Fund	15 09
Board of Education—Physical Education Fund	4 95
Board of Education—School Book Fund	1,253 44
Board of Education—Traveling and Contingent Fund	200 07
Board of Equalization	31 83
Board of Forestry	84 61
Board of Health	1,886 72
Board of Medical Examiners	218 40
Board of Optometry	151 93
Board of Pharmacy	130 99
California School for Deaf and Blind	3 70
California School for Girls	42 22
Cattle Protection Board	153 62
California Polytechnic School	158 30
Children's Year Committee	1 92
Civil Service Commission	918 55
Commission of Horticulture—Emergency	36 03
Commission of Horticulture	1,717 94
Commission of Horticulture—Emergency Resolution 23	171 80
Commission in Lunacy	213 62
Compensation Insurance Fund	271 93
Controller's Office	808 55
Controller—Inheritance Tax	220 08
Controller—Collector of State Revenue	266 15
Controller—Collector Municipal Statistics	1,115 02
Corporation Department	114 77
Committee on Readjustment	147 09
Dairy Bureau	38 55
Engineering Department	86 90
Executive and Administrative Department	332 67
Fish Exchange	52 01
Fish and Game Commission	961 34
Harbor Commission—San Francisco	1,834 70
Highway Commission	1,159 95
Home for Adult Blind	6 46
Immigration and Housing Commission	276 13
Independent Paper Stock Company	41 64
Industrial Accident Commission	549 02
Industrial Welfare Commission	197 60
Insurances Commission	402 97
Judicial Department—Clerk Supreme Court	870 78
Judicial Department—First District Court of Appeal	64 04
Judicial Department—Second District Court of Appeal	43 79
Judicial Department—Third District Court of Appeal	296 23
Land Settlement	333 63
Legislative Counsel Bureau	706 13
Legislature	7,784 50
Library Trustees	997 81
Mining Bureau	3,104 90
Mining Bureau—Petroleum and Gas	390 62
Motor Vehicle Department	3,224 03
State Asylum	1 52
Normal School—Chico	19 56
Normal School—Fresno	22 66
Normal School—Arcata	17 01
Normal School—Los Angeles	2 39

ACCOUNTS RECEIVABLE AS OF JUNE 30, 1919—Continued.

Normal School—San Diego	602 29
Normal School—San Francisco	224 07
Normal School—San Jose	682 81
Pacific Colony	8 07
Preston School of Industry	125 69
Prison at Folsom	53 59
Prison at San Quentin	318 25
Railroad Commission	585 34
Reclamation Board	446 19
Redwood Park Commission	7 46
Real Estate Commission	150 24
Secretary of State	595 77
Secretary of State—Corporation Licenses	272 83
Stallion Registration Board	7 39
State Marketing Commission	82 55
State Purchasing Department	113 13
Superintendent of Public Instruction	794 36
Surveyor General	79 60
Treasurer's Office	81 11
Veterans' Home of California	248 41
Various Officers	98
State Veterinarian	13 42
Viticulural Commission	277 60
Water Commission	5 94
Weights and Measures Department	450 03
Whittier State School	45 75

 \$45,108 17

ABSTRACT OF ACCOUNTS PAYABLE AS OF JUNE 30, 1919.

Allen's Press Clipping Bureau	\$6 00
American-La France Fire Engine Company	38
American Railway Express	30 86
Blake, Moffitt and Towne	231 64
Burroughs Adding Machine Company	70
A. Carlisle and Company	13 50
State Board of Control	175 00
Crane and Company	8 10
J. B. Crowley	87 55
Dome Engraving Company	338 43
Electric Supply Company	3 13
Firestone Tire and Rubber Company	4 18
Fites Ink Manufacturing Company	23 25
E. C. Fuller Company	181 29
W. P. Fuller and Company	1 32
Gimmel and McCoy	13 75
Goodrich, Ballard and Rouse	1 80
Geo. D. Graham	27 80
Great Western Power Company	161 39
Hale Brothers Incorporated	1 10
Norman F. Hall	3 00
Inland Manufacturing Company	10 80
Johnson Oil Burner Company	25 50
Kirk-Geary Company	17 55
Leitch Drayage and Warehouse Company	1 05
Marsh and Kidd Corporation	5 00
Mathews Northrup Works	184 45
L. W. Matthias	77 75
Mergenthaler Linotype Company	49 27
Mohr and Yoerk Market	75
H. C. Muddox Company, Incorporated	90
The Nonpareil	6 55
Union Oil Company of California	43 43
Pacific Coast Paper Company	402 14
Pacific Gas and Electric Company	103 99
Pacific Telephone and Telegraph Company	11 10

ABSTRACT OF ACCOUNTS PAYABLE AS OF JUNE 30, 1919—Continued.

State Purchasing Department.....	35 42
Reader's Welding Works.....	1 75
Jas. S. Remick Company.....	47 19
Richardson-Case Paper Company.....	61 65
City of Sacramento.....	45 00
San Quentin	20 75
Sacramento Gas Company.....	9 65
Sacramento Oxy-Acetylene Works.....	4 35
The Sacramento Rubber Company.....	7 56
Schaw-Batcher Company	79 21
Shattuck, Nye and Bickford, Incorporated.....	91 81
Shell Company of California.....	3 75
Shreve and Company.....	13 50
Sleeper Stamp Company.....	25 40
Standard Oil Company.....	35 23
Superintendent Capitol Building and Grounds.....	8 49
Superior Type Company.....	7 20
Southern Pacific Company.....	1 25
Sutter Photo-Engraving	89 42
R. L. Telfer.....	19 35
The Thompson-Diggs Company.....	7 35
Wet Wash Laundry.....	10 16
Zellerbach Paper Company.....	6,186 33
	<hr/>
	\$9,069 17
State printing plant employees (pay roll for last half of June, 1919).....	8,392 15
	<hr/>
	\$17,461 32

GENERAL PURCHASES, 1918-1919.

Cardboard.

1,000 sheets 3½-ply tough check, green and pearl.....	\$67 50
3,700 sheets 22½ x 28½ 8-ply Aetna and Hero Blanks.....	325 00
500 sheets 25½ x 30½ 220-lb. Acme Index Bristol.....	67 75
1,000 sheets 140-lb. Manila Tag Board.....	30 24
3,000 sheets 22½ x 28½ 120-lb. 3-ply Colored Bristol	153 98
14,500 sheets 25½ x 30½ 110-lb Index Bristol	853 00
1,500 sheets 6-ply Railroad Board.....	143 75
200 sheets 22½ x 28½ 6 ply Aetna Blanks	13 68
2,000 sheets 22½ x 28½ 6-ply White Bristol	142 20
10,600 sheets 22½ x 28½ 2-ply White Bristol	510 48
7,065 sheets 22½ x 28½ 120-lb. Iron Tag Board.....	238 32
500 sheets 25½ x 30½ 220-lb. Index Bristol	61 00
100 sheets White Election Translucent	5 25
400 sheets 25½ x 30½ 170-lb. Gibraltar Index Bristol.....	29 00
28,900 sheets 22½ x 28½ 4-ply Bristol White	1,898 73
5,000 sheets 22½ x 28½ 120-lb. Tag Board	127 50
22,692 sheets 25½ x 30½ 140-lb. Index Bristol	1,717 58
23,900 sheets 22½ x 28½ 3-ply White Bristol	1,350 68
	<hr/>
	\$7,743 54

GENERAL PURCHASES, 1918-1919—Continued.

Bond Paper.

17,500	sheets 17 x 22 No. 25 Crane's Bond	\$472 50
20,500	sheets 17 x 22 No. 21 Crane's Bond	479 70
83,000	sheets 22 x 34 32-lb. Colored Dello Bond	964 17
6,500	sheets 17 x 28 20½-lb. Orient Bond Paper	51 30
50,000	sheets 17 x 22 8-lb. Green Manifold Parchments	250 00
5,000	sheets 25 x 38 51-lb. Trust Bond	138 11
125,000	sheets 22 x 34 40-lb. White Certificate Bond	2,185 00
7,500	sheets 17 x 22 13-lb. White Coupon Bond	108 86
10,000	sheets 24 x 38 39-lb. White Reliance Bond	255 80
10,000	sheets 22 x 34 26-lb. White English	160 00
25,000	sheets 17 x 28 20½-lb. White Standard	350 55
15,000	sheets 17 x 28 20½-lb. White Orient	163 80
30,000	sheets 28 x 44 40-lb. Map	922 20
81,000	sheets 22 x 34 40-lb. White Reliance	2,193 48
25,000	sheets 17 x 28 25-lb. White American Trust	339 15
7,500	sheets 22 x 34 32-lb. Green Certificate Bond	139 08
20,000	sheets 22 x 34 32-lb. Buff California Bond	380 16
53,500	sheets 17 x 28 20-lb. Colored English Bond	714 38
3,000	sheets 17 x 28 16½-lb. White Exchange Bond	42 07
20,000	sheets 22 x 34 32-lb. Canary English Bond	551 39
10,000	sheets 24 x 38 39-lb. White Certificate Bond	200 07
25,000	sheets 17 x 28 25½-lb. White Orient	327 04
12,500	sheets 22 x 34 32-lb. Blue Certificate Bond	175 00
112,500	sheets 12 x 22 8-lb. Superior Manifold	940 50
12,500	sheets 22 x 34 32-lb. Buff Certificate	178 00
5,000	sheets 22 x 34 32-lb. Blue English Bond	88 00
50,000	sheets 22 x 34 40-lb. White Exchange	1,108 00
500	sheets 22 x 34 32-lb. Cherry English	8 64
87,500	sheets 22 x 34 32-lb. White Exchange	1,728 80
5,000	sheets 22 x 34 32-lb. Golden Rod English	100 80
7,500	sheets 22 x 34 40-lb. Buff California	178 20
8,000	sheets 22 x 34 40-lb. Blue and White California	218 88
7,500	sheets 22 x 34 24-lb. Golden Rod English	159 60
96,500	sheets 22 x 34 40-lb. White Excelsior	1,209 84
68,363	sheets 28 x 34 33-lb. White Exchange	1,903 18
12,500	sheets 24 x 38 39-lb. White American Trust	234 03
225,000	sheets 22 x 34 32-lb. White Certificate	3,108 00
70,000	sheets 22 x 34 32-lb. White Excelsior	711 20
38,500	sheets 17 x 28 25½-lb. White Certificate	454 41
2,500	sheets 22 x 34 32-lb. Pink English	46 40
4,500	sheets 24 x 38 39-lb. Pink California	104 31
12,500	sheets 17 x 22 13-lb. White Mercantile	171 00
22,500	sheets 28 x 34 51-lb. Excelsior	364 33
25,000	sheets 22 x 34 26-lb. White Certificate	340 00
25,000	sheets 19 x 24 24½-lb. White Certificate	260 31
12,500	sheets 25 x 38 40-lb. White Orient	238 31
12,500	sheets 22 x 34 32-lb. Pink Certificate	178 00
25,000	sheets 17 x 28 20½-lb. White Certificate	261 38
15,000	sheets 22 x 34 32-lb. Russet English	314 04
7,500	sheets 22 x 34 24-lb. Canary English	150 48

\$26,350 39

Ledger Paper.

11,500	sheets 23 x 36 80-lb. Resolute	\$515 20
5,200	sheets 19 x 24 44-lb. White Reliance	130 42
25,373	sheets 17 x 28 40½-lb. White Reliance and Vulcan	628 56
7,500	sheets 21 x 32 57-lb. White Vulcan	284 29
4,000	sheets 24 x 28½ 52-lb. Buff Reliance	153 63
4,978	sheets 21 x 32 57-lb. Blue Tisrite	215 65
3,000	sheets 24 x 38 63½-lb. Vulcan	163 20
5,000	sheets 17 x 28 40½-lb. Buff Vulcan	149 85
12,500	sheets 17 x 28 40½-lb. Buff Reliance	202 30
15,925	sheets 23 x 36 80-lb. White Reliance	774 18
33,375	sheets 21 x 32 57-lb. White Reliance	1,156 73
5,000	sheets 24 x 38 88-lb. White Reliance	317 68
13,000	sheets 20 x 28 54-lb. White Reliance	400 14
4,965	sheets 23 x 31 63½-lb. No. 36 White Reliance	247 04
4,750	sheets 21 x 32 57-lb. Buff Vulcan	190 34
24,000	sheets 24 x 38 68-lb. Reliance	1,033 64
2,500	sheets 22 x 34 64-lb. Blue Reliance	115 20

\$9,678 05

GENERAL PURCHASES, 1918-1919—Continued.

Miscellaneous.

875	sheets 17 x 22 No. 56 Crane's Artificial Parchment.....	\$104 37
23,000	sheets 17 x 28 Safety	504 90
17,500	sheets 17 x 22 Non-Curl Gum Paper	282 50
8	sheets 14 x 17 Genuine Parchment	13 20
24	sheets 14 x 10½ Imitation Parchment	1 04
7,500	sheets 19 x 24 No. 1 French Folio (tissue paper)	45 75
12,500	sheets 22 x 34 No. 1 French Folio (glazed)	109 25
54	sheets 30 x 40 No. 2 Parchment Paper	1 72
522	sheets 6 x 8 No. 56 Crane's Artificial Parchment.....	8 52
14,500	sheets 8½ x 11 Mimeograph Paper	15 67
4,000	sheets 17 x 28 No. 1 French Folio 10-lb. Onion Skin.....	104 23
17,500	sheets 17 x 22 No. 1 8-lb. Rough, Unglazed French Folio.....	152 35
		<hr/>
		\$1,433 50

Envelopes.

60,000	No. 10 white Outlook envelopes	\$246 30
1,000	No. 10 white Tisrite Bond envelopes.....	6 33
464,000	No. 50 6½ x 9½ open end Manila envelopes.....	1,558 58
3,000	No. 5 white envelopes	5 70
10,000	No. 14 white envelopes	72 77
10,000	No. 70 C. C. Manila envelopes.....	128 00
10,000	No. 75 C. C. Manila envelopes.....	106 40
7,000	No. 50 C. C. Manila envelopes.....	64 40
5,000	No. 63 C. C. Manila envelopes.....	52 45
1,055,500	No. 10 Manila envelopes	2,593 73
2,000	No. 9 white Outlook envelopes.....	16 38
10,000	No. 3 coin envelopes, 2½ x 4½	10 71
3,000	6½ x 9½ heavy O. E. Manila, unglued.....	28 74
50,000	No. 9 Manila	134 50
5,000	No. 15 C. C. Manila	36 70
500	No. 12 White Tisrite Bond	3 80
20,000	No. 9 white	69 80
3,000	No. 10 White Postage Savers.....	18 00
40,000	No. 7 white	119 40
100,500	No. 6½ Manila	152 58
7,500	No. 5 Manila	12 75
241,000	No. 6½ white	439 50
41,000	50-lb. 9½ x 12½ Manila O. E.	352 60
3,000	No. 6 5½ x 8½ Scarf O. E. Manila	12 54
10,000	No. 97 C. C. Manila	166 70
2,000	No. 50 O. E. Manila 8½ x 10½	15 90
975,000	No. 9 Reliance Bond	61 72
12,000	No. 12 white	96 15
36,000	36-lb. 6½ x 9½ O. E. Manila	121 68
49,500	No. 10 Manila Window	166 32
98,750	No. 11 Tension Clasp Manila.....	1,027 00
20,000	No. 9 Manila Window	63 80
50,674	No. 28 9 x 12 Tension Clasp Manila.....	629 88
22,500	No. 90 Col. Clasp, Manila.....	324 83
10,000	No. 4½ 3 x 4½ Coin	12 20
20,000	50-lb. 7½ x 10½ Manila	57 70
5,000	No. 6½ Certificate Bond	12 60
2,600	No. 10 White Crane's Bond.....	18 30
1,044,500	No. 6½ white	2,000 49
20,175	No. 25 Tension Clasp, Manila.....	217 68
5,000	No. 93 C. C. Manila.....	89 30
195,250	No. 19 Tension Clasp, Manila, 6½ x 10.....	1,858 78
98,500	No. 6½ Window	228 52
421,500	No. 6½ Manila	610 23
10,000	No. 3 7 x 10 O. E. Manila Catalogue.....	45 30
98,075	No. 20 7 x 10½ Tension Clasp, Manila	1,015 08
37,500	No. 6½ Manila Window	81 75
511,500	No. 10 white	1,969 77
30,000	No. 11 white	166 80
26,425	No. 19½ Tension Clasp Manila, 7 x 10.....	255 27
10,000	No. 95 Col. Clasp Manila.....	179 40
10,044	No. 94 6 x 9 Tension Clasp, Manila	90 40
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		\$17,890 61

GENERAL PURCHASES, 1918-1919—Continued.

Flat Paper.

37,000	sheets 22 x 34 40-lb. Hamburg	\$586 56
20,000	sheets 17 x 28 25½-lb. Hamburg	197 60
135,600	sheets 17 x 28 30½-lb. Albermarle	1,426 92
10,000	sheets 22 x 34 32-lb. Hamburg	136 72
8,000	sheets 22 x 34 40-lb. Oakland	180 00
32,500	sheets 17 x 22 24-lb. Pacific Coast	407 16
34,750	sheets 22 x 34 48-lb. Hamburg	656 35
29,000	sheets 17 x 22 20-lb. Pacific Coast	302 76
79,000	sheets 17 x 22 24-lb. colored	911 81
5,000	sheets 17 x 28 32-lb. colored	78 23
25,000	sheets 22 x 34 40-lb. St. Charles	486 00
133,100	sheets 17 x 28 25½-lb. Palo Alto	1,486 10
61,273	sheets 22 x 34 48-lb. Albermarle	1,128 05
7,500	sheets 17 x 28 30½-lb. Canary	111 30
7,500	sheets 22 x 34 40-lb. Pacific Coast	156 63
25,000	sheets 22 x 34 40-lb. White Norfolk	320 00
97,000	sheets 17 x 28 30½-lb. Oakland	1,349 82
57,075	sheets 17 x 28 30½-lb. Palo Alto	757 25
5,000	sheets 17 x 28 30½-lb. Pink	74 20
9,565	sheets 24 x 38 59-lb. Oakland	289 50
54,875	sheets 22 x 34 40-lb. Albermarle	736 23
25,000	sheets 17 x 28 25½-lb. White Norfolk	204 00
51,000	sheets 22 x 34 48-lb. Palo Alto	1,064 88
249,825	sheets 17 x 28 25½-lb. Albermarle	2,197 82
8,750	sheets 22 x 34 48-lb. Pacific Coast	215 24
10,827	sheets 22 x 34 48-lb. St. Charles	353 46
7,500	sheets 17 x 28 30½-lb. Blue Standard	123 07
2,500	sheets 17 x 28 30½-lb. Salmon	33 63
54,775	sheets 22 x 34 40-lb. Palo Alto	953 09
		<hr/>
		\$16,935 29

Manila Paper.

10,000	sheets 22 x 34 36-lb. Chemical Manila, white	\$85 28
4,800	sheets 40 x 48 100-lb. Manila	90 39
5,000	sheets 17 x 28 20½-lb. Chemical Manila, pink	22 13
5,000	sheets 17 x 28 20-lb. Chemical Manila, blue	21 61
34,620	sheets 22 x 34 32-lb. Chemical Manila, blue	334 56
43,200	sheets 36 x 48 200-lb. H & W Manila paper	2,080 00
22,380	sheets 40 x 48 150-lb. Manila	551 85
12,500	sheets 19 x 24 24-lb. Chemical Manila, yellow	91 80
26,000	sheets 22 x 34 32-lb. Chemical Manila, pink	252 38
22,500	sheets 22 x 34 40-lb. Chemical Manila, white	248 85
75,000	sheets 17 x 28 20½-lb. Chemical Manila, yellow	398 00
80,000	sheets 22 x 34 32-lb. Chemical Manila, white	639 90
178,020	sheets 22 x 34 32-lb. Chemical Manila, yellow	1,445 82
179,000	sheets 22 x 34 32-lb. Chemical Manila, yellow	1,463 02
		<hr/>
		\$7,744 48

Improved Stock.

6,000	sheets stock ledger sheets, ruled and printed	\$105 83
400	sheets 14-column ruled paper	7 77
1,973	sheets check register master sheet	12 87
9,160	sheets claim blanks (labor) 8½ x 8	43 33
6,163	sheets committee ruled blanks, 32-lb. 17 x 28	18 96
5,912	sheets claim blanks 8½ x 14	41 06
		<hr/>
		\$230 82

Cover Paper.

100	sheets 25 x 40 95-lb. Antique Practical Cover, russet	\$4 56
100	sheets 22½ x 28½ 90-lb. Antique Princess, gray	11 52
7,500	sheets 18 x 31 40-lb. Manuscript Cover	199 50
61,850	sheets 30 x 25 65-lb. Buckeye Cover	1,676 74
43,195	sheets 20 x 25 50-lb. S. & S. C. Cover, various colors	610 91
25,564	sheets 20 x 25 65-lb. Fawn S. & S. C. Cover	508 47
9,500	sheets 22½ x 28½ 80-lb. Buckeye Cover	313 50
		<hr/>
		\$3,325 20

PURCHASES, BINDERY MATERIAL—Continued.

School Book Stock.

217,650	sheets 31 x 46 110-lb. Textbook Paper	\$4,463 87
50,000	sheets Dbl. Thk. Br. Antq. Buckeye Cover	4,580 00
2,419,675	sheets 31 x 46 90-lb. Textbook Paper	41,066 78
563,500	sheets 34 x 51 100-lb. Textbook Paper	11,405 97
105,650	sheets 31 x 42 80-lb. Textbook Paper	1,435 16
55,000	sheets 23 x 31 Heavy Brown Cover Paper	3,465 06
		<hr/> \$63,393 78

Shipping Tags.

35,000	No. 5-E Manila Shipping tags	\$59 00
4,000	No. 6-CX Cloth Shipping Tags	25 00
7,000	No. 8-EC Red Tags	15 96
10,000	No. 6-G Manila Shipping Tags	17 15
5,000	No. 8-E Manila Shipping Tags	14 65
6,000	No. 5-CX Linen Shipping Tags	31 62
		<hr/> \$163 98

Book Paper.

90,000	sheets 38 x 50 160-lb. White Coated Book	\$985 12
83,250	sheets 26 x 40 Trinity Bible Paper	1,776 56
6,775	sheets 32 x 44 Oxford Bible Paper	180 02
520,100	sheets 38 x 50 96 M. F. Book Paper	11,184 24
38,350	sheets 25 x 38 80-lb. Coated Book	940 82
214,100	sheets 38 x 50 90-lb. M. F. Book Paper	5,010 85
2,500	sheets 32 x 46 120-lb. White Egg Shell Book	88 35
7,427	sheets 29 x 43 120-lb. Brief Paper	235 61
333,825	sheets 38 x 50 112-lb. S. & S. C. Book	8,080 91
12,600	sheets 25 x 38 100-lb. Coated Book Paper	362 88
537,575	sheets 38 x 50 80-lb. M. F. Book Paper	9,628 38
3,774	reams 38 x 50 80-lb. News Paper	26,555 28
164½	reams 34 x 51 100-lb. Super Textbook	1,883 53
		<hr/> \$60,865 61

RUBBER STAMP STOCK PURCHASES—JULY 1918 - 1919

12	No. 2 Triumph line daters	\$12 14
12	No. 1 Triumph line daters	9 59
12	sets bands for Royal daters	4 80
6	sets bands for No. 6 Midget daters	1 20
6	sets bands for No. 1½ Defiance daters	1 20
120	special mortised cushions	26 00
6	sets bands for No. 1 Standard	1 80
1,200	handles	8 28
100	No. 4 handles	1 25
12	No. 14 Kossuth type band daters	32 72
12	No. 14 Kossuth type band daters	33 00
6	air cushion stamp mounts	84
6	air cushion stamp mounts	84
6	No. 1½ Acme daters	1 74
12	No. 1½ Acme daters	8 60
12	No. 1½ Pioneer line daters	1 80
144	solid rubber daters	15 00
12	No. 0 Crown daters	2 29
120½	pounds rubber stamp rubber	143 71
595	strips mouldings and mountings	100 40
12	bottles Opague ink	2 80
24	Perfected daters	26 40
		<hr/> \$431 40

PURCHASES, BINDERY MATERIAL.

Binder's Board.

485	bundles 27 x 32 No. 25 tar board.....	\$1,239 79
464	bundles 2½ x 31½ No. 25 tar board.....	2,395 31
408	bundles 26 x 38 50-lb. chip board and other board.....	831 30
378	bundles 23 x 31½ No. 30 tar board	829 71

\$7,993 78

Binder's Cloth.

40	yards No. 92 library buckram, green }	\$63 36
48	yards No. 75 library buckram, black }	
120	yards No. 399 library buckram, red.....	86 40
160	yards No. 92 library buckram, green.....	123 20
10	spools cotton thread	50
5	yards waterproof auto top cloth.....	10 00
502	yards 28-inch brown canvas	205 82
100	yards corduroy	82 50
10	yards dark brown canvas	6 50
112	yards cloth	40 32
3	bolts narrow violet ribbon	75
1	bolt narrow violet ribbon	50
10	bolts narrow violet ribbon	2 45
3	bolts narrow violet ribbon	75
2,964½	yards muslin	373 29
7,500	yards XT No. 1½ textbook stock.....	2,424 00
25	sheets cotton wadding	1 75
14	yards 42-inch map cloth	12 60
191½	yards gold satin	277 13
63½	yards red satin	91 71
64½	yards gold satin	94 25
35	yards red satin	54 91
1	yard violet silk	2 00
1	yard violet silk	1 75
4	yards violet silk	8 00
3	yards violet silk	6 00

\$3,970 44

Leather.

495½	feet red cowhide	\$193 34
72	skins black title leather	88 50
60	skins red title leather	78 75
65	yards imitation leather for hand books.....	55 25
41½	feet black Morocco leather	15 26
24½	feet wine Morocco leather	10 43
677½	feet black Morocco leather	304 77
95	feet maroon Morocco leather	46 08
8	feet black Morocco leather	3 00
215	feet maroon Morocco leather	104 64

\$900 62

Paper.

5,000	sheets 25 x 38 80-lb. rough lining paper	\$136 80
763	pounds 1½-inch back lining paper }	
886	pounds 1½-inch back lining paper }	294 20

\$386 00

Binders and Parts.

18	loose leaf binders	\$79 46
18	loose leaf binders, corduroy covered.....	79 46
100	section post metals	110 00
25	sectional post metals	22 50
2,000	Langs index stays (gum).....	3 40
50	section post-slotted lock metals 3/16-½-inch	55 75

\$350 57

Binder's Board.

100	sheets 28 x 42 tan stencil board	\$33 00
422	bundles 27 x 32 No. 20 tar board	478 15
831	bundles 23 x 31½ No. 30 tar board	2,158 52
2	bundles No. 25 Davey's tar board	8 00

INVENTORY OF STOCK, JUNE 30, 1919—Continued.

Miscellaneous.

12,240	yards black tape	\$87 55
60	spools round No. 25 wire.....	90 00
40	spools round No. 25 wire.....	60 00
350	spools round No. 25 wire.....	292 25
150	flat 20 x 25 wire	135 00
100	spools round No. 30 wire.....	102 50
600	spools wire	90 00
20	packages gold leaf	195 00
2	packages gold leaf	11 11
2	packages gold leaf	11 11
1	package gold leaf	5 58
10	packages Austrian gold leaf, 10 x 12.....	210 00
24	pounds bookbinders' gloss ink, blue.....	48 00
30	gross black shoe strings	52 50
10	gross No. 28 black celluloid covered fasteners.....	20 97
10	gross No. 27 maroon celluloid covered fasteners.....	42 03
500	card cases	12 06
36	quarts liquid glue	23 25
		<hr/>
		\$1,488 91

INK PURCHASES, 1918-1919.

1,385	pounds halftone black	\$606 25
160	pounds bond black	122 75
1,557	pounds news black	186 84
500	pounds book black	125 00
35	pounds policy black	26 25
5	pounds process red	7 50
25	pounds poster red	12 00
10	pounds antique red	20 00
2	pounds red copy	8 50
10	pounds deep rose lake	15 00
10	pounds scarlet lake	25 00
45	pounds Moire blue	50 00
10	pounds letter head blue	13 50
5	pounds tri chromatic blue	7 50
10	pounds blue lake	17 50
12	pounds job purple	18 50
2	pounds purple copy	8 50
20	pounds orange	22 00
5	pounds Persian orange	7 50
20	pounds lemon yellow	10 00
20	pounds job white	9 50
75	pounds lakatine	27 50
10	pounds Antismudge ink reducer	20 00
10	gallons reducing varnish	30 00
		<hr/>
		\$1,397 09

INVENTORY OF STOCK, JUNE 30, 1919.

Book Paper.

1,510	sheets 28 x 42 69-lb. M. F. book paper	\$7 85
98,500	sheets 38 x 50 80-lb. M. F. book	1,765 12
21,500	sheets 38 x 50 90-lb. M. F. book	419 05
233,750	sheets 38 x 50 96-lb. M. F. book	5,026 56
6,108	sheets 21 x 43 120-lb. brief	196 52
83,250	sheets 26 x 40 Trinity Bible	1,776 50
6,775	sheets 32 x 44 Oxford Bible	189 02
108	sheets 25 x 38 61-lb. laid book	1 30
365	sheets 22 x 40 60-lb. eggshell book paper	2 72
2,560	sheets 25 x 38 80-lb. eggshell	49 02
2,500	sheets 32 x 46 120-lb. eggshell, white	88 35
1,360	sheet 9 x 25 20-lb. coated	7 49
100	sheets 25 x 38 80-lb. coated	2 52
1,250	sheets 28 x 42 100-lb. coated	26 30
2,587	sheets 25 x 38 100-lb. coated	74 50
2,750	sheets 38 x 50 100-lb. coated, white	132 70
1,810	sheets 25 x 38 60-lb. railroad folder, pink	33 12
380	sheets 25 x 38 60-lb. railroad folder, yellow	6 95
2,875	sheets 25 x 38 60-lb. railroad folder, blue	50 89
690	sheets 26 x 40 39 lb. news paper	3 49
365,000	sheets 38 x 50 80-lb. news paper	4,898 00
2,500	sheets 28½ x 50 98-lb. S. & S. C.	20 75
63,750	sheets 38 x 50 112-lb. S. & S. C.	1,461 21

\$16,239 99

Ledger Paper.

40	sheets 17 x 28 40½-lb. A. Z. and S. Ledger, buff	\$1 10
760	sheets 16 x 21 20-lb. Brown's Ledger	11 87
10	sheets 19 x 24 44-lb. Brown's Ledger	35
17	sheets 16 x 21 28 lb. Brown's Ledger	37
1,233	sheets 19 x 48 88-lb. Defiance Ledger, white	71 13
50	sheets 20 x 28 54-lb. Defiance Ledger, buff	1 32
48	sheets 24 x 38 88-lb. Mills Ledger	2 18
93	sheets 24 x 28½ 52-lb. Mills Ledger, buff	1 87
1,078	sheets 20 x 28 54-lb. Mills Ledger, buff	22 59
5,142	sheets 24 x 38 68-lb. Reliance Ledger	199 31
56	sheets 19 x 48 88-lb. Reliance Ledger	1 38
7,932	sheets 17 x 28 40½-lb. Reliance Ledger, white	211 84
9,683	sheets 20 x 28 54-lb. Reliance Ledger, white	298 05
8,654	sheets 21 x 32 57-lb. Reliance Ledger, white	310 78
5,000	sheets 23 x 31 68½-lb. Reliance Ledger, white	131 32
9,340	sheets 23 x 36 80-lb. Reliance Ledger, white	470 73
4,942	sheets 24 x 38 88-lb. Reliance Ledger, white	314 00
3,300	sheets 17 x 28 40½-lb. Reliance Ledger, buff	89 10
3,000	sheets 24 x 28½ 51-lb. Reliance Ledger, buff	114 11
2,470	sheets 24 x 38 88-lb. Reliance Ledger, buff	106 91
7,545	sheets 17 x 28 40½-lb. Reliance Ledger, blue	206 05
4,636	sheets 20 x 28 54-lb. Reliance Ledger, blue	103 57
1,285	sheets 21 x 32 57-lb. Reliance Ledger, blue	36 49
485	sheets 22 x 34 60-lb. Reliance Ledger, blue	16 88
2,500	sheets 22 x 34 64-lb. Reliance Ledger, blue	115 20
2,165	sheets 24 x 38 68-lb. Reliance Ledger, blue	89 89
29	sheets 23 x 36 72-lb. Reliance Ledger, blue	1 11
25	sheets 23 x 36 80-lb. Reliance Ledger, blue	63
1,400	sheets 19 x 21 44-lb. Scotch Ledger	31 13
2,992	sheets 20 x 28 54-lb. Scotch Ledger, white	157 37
2,628	sheets 24 x 38 88-lb. Scotch Ledger, white	198 39
1,707	sheets 21 x 32 57-lb. Tisrite Ledger, blue	73 95
763	sheets 24 x 38 88-lb. Tisrite Ledger, blue	17 87
69	sheets 24 x 38 88-lb. Tisrite Ledger, buff	3 28
500	sheets 24 x 28½ 52-lb. Vulcan Ledger, white	13 26
2,500	sheets 21 x 32 57-lb. Vulcan Ledger, white	94 76
2,544	sheets 17 x 28 40½-lb. Vulcan Ledger, buff	76 24
3,729	21 x 32 57-lb. Vulcan Ledger, buff	149 45
2,726	sheets 24 x 38 68½-lb. Vulcan Ledger, buff	146 91
84	sheets 18 x 23 40-lb. Weston's Ledger	2 63
272	sheets 20 x 28 54-lb. Weston's Ledger	11 96
1,000	sheets 19 x 24 44-lb. Weston's Ledger, white	34 10
257	23 x 31 72-lb. Weston's Ledger, white	16 53

\$6,957 90

INVENTORY OF STOCK, JUNE 30, 1919—Continued.

Improved Stock.

625	17 x 22 20 lb. Ardmore Linen	\$5 75
460	fly sheets, dist. ledger	6 21
885	cash received sheets	13 27
250	Imperial Parchment Linen	2 86
920	17 x 28 28-lb. ruled bill heads, Carmel	10 67
400	14 x 19 14-column ruled paper	7 77
5,600	17 x 28 32-lb. committee ruled blanks	18 96
1,435	17 x 29 legal ruled paper	22 96
265	17 x 28 35 lb. legislature desk ruled	3 40
880	17 x 28 32-lb. Standard legal ruled blanks	10 07
2,277	8½ x 8 ruled and printed claim blanks	9 11
2,886	8½ x 14 ruled and printed claim blanks	14 43
275	Form 11A ruled Department Analysis, master sheet	6 94
1,796	ruled and printed stock ledger sheets—master	21 28
6,000	ruled and printed stock ledger sheets—fly	85 55
1,372	check register sheets (fly sheet)	13 72
2,579	check register master sheet	27 47
585	ruled stockholders' record book blanks	18 99
82	master sheet—Appropriation Ledger	1 74
		<hr/>
		\$296 15

Flat Paper.

249,825	sheets 17 x 28 ½-lb. Albermarle	\$2,197 82
54,825	sheets 22 x 34 40-lb. Albermarle	735 50
35,628	sheets 22 x 34 48-lb. Albermarle	573 02
1,152	sheets 17 x 22 16-lb. colored, fawn	1 49
4,698	sheets 17 x 22 16-lb. colored, canary	18 32
500	sheets 17 x 22 16-lb. colored, light blue	1 95
5,588	sheets 17 x 22 16-lb. colored, cherry	21 59
2,974	sheets 17 x 22 16-lb. colored, green	11 58
5,000	sheets 19 x 24 28-lb. colored, blue	27 77
2,338	sheets 17 x 22 24-lb. colored, fawn	22 99
3,065	sheets 17 x 22 24-lb. colored, light blue	29 89
3,952	sheets 17 x 22 24-lb. colored, green	38 54
2,600	sheets 17 x 22 24-lb. colored, capaline	28 28
1,718	sheets 19 x 24 28-lb. colored, Marguerite	9 53
6,020	sheets 17 x 22 24-lb. colored, amber	58 51
6,796	sheets 17 x 22 24-lb. colored, dark blue	66 28
2,838	sheets 17 x 22 24-lb. colored, melon	22 80
3,380	sheets 17 x 22 24-lb. colored, cherry	32 96
4,400	sheets 19 x 24 24-lb. colored, pink	51 19
5,984	sheets 17 x 22 24-lb. colored, pink	58 35
9,132	sheets 17 x 22 24-lb. colored, canary	89 05
182	sheets 19 x 24 28-lb. colored, pink	1 01
7,440	sheets 18 x 28 30½-lb. colored, canary	110 41
3,720	sheets 17 x 28 30½-lb. colored, pink	55 21
2,500	sheets 17 x 28 30½-lb. colored, salmon	33 63
3,610	sheets 17 x 28 32-lb. colored, fawn	43 27
20	sheets 17 x 28 32-lb. colored, canary	23
1,579	sheets 17 x 28 32-lb. colored, pink	18 93
1,215	sheets 17 x 28 32-lb. colored, azure	14 56
15,174	sheets 17 x 28 25½-lb. Norfolk, white	123 82
21,712	sheets 22 x 34 40-lb. Norfolk, white	277 91
430	sheets 22 x 31 40-lb. Pacific Coast	8 98
248	sheets 22 x 34 48-lb. Pacific Coast	6 24
17,500	sheets 17 x 28 30½-lb. Oakland, white	885 92
4,072	sheets 24 x 38 50-lb. Oakland	123 25
86,389	sheets 17 x 28 25½-lb. Palo Alto	958 27
46,824	sheets 17 x 28 30½-lb. Palo Alto	621 24
1,850	sheets 19 x 24 32-lb. Palo Alto	23 09
1,090	sheets 17 x 28 40 lb. Palo Alto	20 41
54,700	sheets 22 x 34 40 lb. Palo Alto	951 78
46,944	sheets 22 x 34 48-lb. Palo Alto	960 20
7,490	sheets 22 x 34 40-lb. St. Charles, white	145 61
13,250	sheets 22 x 34 48-lb. St. Charles, white	286 20
2,593	sheets 17 x 28 30½-lb. Standard, blue	85 19

\$9,776 48

INVENTORY OF STOCK, JUNE 30, 1919—Continued.

Manila Paper.

2,350	sheets 17 x 28 20-lb. Chemical Manila, blue	\$10 15
4,100	sheets 17 x 28 20½-lb. Chemical Manila, pink	26 35
12,404	sheets 17 x 28 20½-lb. Chemical Manila, yellow	72 30
1,850	sheets 19 x 24 24-lb. Chemical Manila, yellow	13 56
9,000	sheets 17 x 28 28-lb. Chemical Manila, white	63 00
42,000	sheets 22 x 34 32-lb. Chemical Manila, white	337 23
16,030	sheets 22 x 34 32-lb. Chemical Manila, blue	163 11
5,230	sheets 22 x 34 32-lb. Chemical Manila, pink	39 71
50,374	sheets 22 x 34 32-lb. Chemical Manila, yellow	392 85
7,875	sheets 22 x 34 40-lb. Chemical Manila, pink	51 74
3,500	sheets 22 x 34 40-lb. Chemical Manila, white	38 43
3,293	sheets 36 x 48 200-lb. Jute Manila	113 62
2,165	sheets 40 x 48 130-lb. Manila	65 72
3,425	sheets 40 x 48 150-lb. Manila	101 68

\$1,469 45

Shipping Tags.

4,000	No. 6 CX cloth shipping tags	\$25 00
25,000	No. 5 E Manila shipping tags	39 22
5,400	No. 5 CX linen shipping tags	28 45
6,000	No. 8 E Manila	16 62
3,000	No. 7 E Manila	3 10
11,100	No. 6 G Manila	18 29
2,750	No. 4 DG Manila	1 95
47,000	No. 8 EC red	95 96

\$228 59

Textbook Paper.

1,303,250	sheets 31 x 46 90-lb. Textbook paper	\$19,950 36
4,300	sheets 23 x 31 double thick brown antique Buckeye Cover	392 16
107,000	sheets 21 x 46 110-lb. Textbook paper	1,997 37
30,500	sheets 31 x 42 8½-lb. Textbook paper	414 56
261,000	sheets 34 x 51 100-lb. Textbook paper	4,443 07
49,400	sheets 23 x 31 heavy brown cover paper	3,112 20
5,535	sheets 27 x 33 120-lb. French gray cover	154 43

\$30,164 15

Parchment Paper.

2,465	sheets 17 x 22 20-lb. Ardmore Linen	\$17 75
235	sheets 19 x 24 24-lb. Savoy Linen	1 69
462	sheets 17 x 22 18-lb. Imperial Parchment	4 46
460	sheets 19 x 24 24-lb. Imperial Parchment	5 52
8,865	sheets 24 x 38 48-lb. Imperial Parchment	212 52

\$241 94

Envelopes.

200	No. 6½ Alexis Bond	\$ 50
3,000	No. 6½ Alexis Bond, blue	7 28
995	No. 10 Alexis Bond, blue, linen finish	5 03
275	No. 6½ Amber Laid	33
175	No. 5 Baronial	25
75	No. 7 Baronial	11
1,000	No. 7 Baronial, white	2 14
2,500	No. 6½ Brother Jonathan Bond, linen finish	4 67
2,000	No. 6½ Brother Jonathan Bond	2 95
500	No. 10 Brother Jonathan Bond, linen finish	1 79
3,950	No. 11 Brother Jonathan Bond	16 75
2,400	No. 12 Brother Jonathan Bond	8 35
6,100	No. 5 C. C. Manila	20 41
3,425	No. 15 C. C. Manila	25 14
250	No. 20 C. C. Manila	75
63,250	No. 25 C. C. Manila	344 08
5,100	No. 30 C. C. Manila	42 69
738	No. 35 C. C. Manila	5 24
8,200	No. 40 C. C. Manila	30 10
8,250	No. 50 C. C. Manila	75 34
9,850	No. 60 C. C. Manila	61 17
4,000	No. 63 C. C. Manila	41 96
1,750	No. 68 C. C. Manila	15 14
1,750	No. 93 C. C. Manila	31 28

INVENTORY OF STOCK, JUNE 30, 1919—Continued.

4,840	No. 95 C. C. Manila	73 99
8,400	No. 97 C. C. Manila	139 45
9,500	No. 1 Coin 2½ x 3½	6 55
10,250	No. 3 Coin 2½ x 4½	10 92
11,975	No. 4½ Coin 3 x 4½	13 25
125	O. E. Cloth (thumb cut) 4½ x 9½	2 18
215	No. 14 Cloth Lined	5 30
2,425	No. 10 English Bond, white	8 85
400	Wide Imperial, 7½ x 7½	88
9,125	6XXXX Imperial Parchment	27 37
700	No. 6½ California and Hickory Bond, white	1 56
2,325	No. 15 Hickory Bond, blue	6 01
575	No. 20 6½ Hickory Bond, white	1 44
4,400	No. 6½ Laid, blue	7 29
85,275	No. 6½ Manila	93 99
11,500	No. 9 Manila	32 68
400,500	No. 10 Manila	1,009 26
20,500	No. 10 Manila, window	68 52
21,500	No. 6½ Manila, window	45 58
23,750	No. 11 Manila	70 30
51,900	No. 11 Manila, tension clasp	589 76
4,450	No. 12 Manila	9 61
2,290	No. 14 Manila	3 76
13,400	O. E. Manila, 50-lb. 4½ x 7½	23 99
500	No. 6 O. E. Manila, 5½ x 8½	2 09
7,044	No. 9½ Manila, tension clasp	63 40
133,500	O. E. Manila 50-lb. 6½ x 9½	434 21
182,350	No. 19 Manila, tension clasp	1,735 97
2,000	O. E. Manila 50-lb. 6½ x 10½	7 24
11,500	O. E. Manila 50-lb. 7½ x 10½	55 77
11,250	O. E. Manila 50-lb. 9½ x 12½	85 11
10,500	No. 3 O. E. Manila Catalogue 50-lb. 7 x 10	46 25
8,500	No. 25 Manila, tension clasp, 8 x 11	37 66
20,175	No. 19½ Manila, tension clasp, 7 x 10	194 89
76,650	No. 20 Manila, tension clasp, 7 x 10½	793 34
26,174	No. 28 Manila, tension clasp, 9 x 12	325 37
7,125	No. 11 National Bank Bond	19 50
1,000	No. 10 Outlook, white	3 38
400	No. 6½ Old Veda Bond, white	90
9,700	No. 6½ Saxon Bond, linen finish	14 77
950	No. 6½ Saxon Bond, linen finish	1 15
275	No. 10 Saxon Bond	91
1,090	No. 6½ Standard Bond, white	2 33
20,000	No. 6½ Standard Bond, R. F.	43 00
12,000	No. 10 Standard Bond, white	53 64
2,175	No. 10 Stratford Bond, linen finish, white	12 00
875	No. 6½ Stratford, linen finish, white	2 97
1,000	No. 5 White	86
84,000	No. 6½ White	120 96
22,000	No. 6½ White	37 20
4,500	No. 7 White	12 55
7,650	No. 8 White	10 71
8,000	No. 9 White	27 92
38,450	No. 10 White	124 97
19,950	No. 11 White	100 13
14,500	No. 12 White	92 95
6,800	No. 14 White	49 90
99,500	No. 6½ White	230 84

\$7,690 85

INVENTORY OF STOCK, JUNE 30, 1919—Continued.

Bond Paper.

3,856	sheets	17 x 28	16½-lb.	Agawam Bond	\$44 65
50	sheets	17 x 28	24-lb.	Agawam Bond	81
125	sheets	22 x 34	40-lb.	Agawam Bond	3 33
12,465	sheets	24 x 8	39-lb.	American Trust Bond, white	263 29
32	sheets	22 x 34	26-lb.	Bay Path Bond, pink	43
4,839	sheets	24 x 38	40-lb.	Bank Bond, blue	42 60
185	sheets	17 x 22	No. 21	Crane's Bond, blue	4 33
5,060	sheets	17 x 22	No. 21	Crane's Bond, white	118 40
5,440	sheets	17 x 28	No. 21	Crane's Bond, white	122 94
200	sheets	17 x 28	No. 21	Crane's Bond, pink	4 08
1,105	sheets	19 x 24	No. 21	Crane's Bond Paper, white	23 20
1,324	sheets	19 x 24	No. 25	Crane's Bond Paper, white	30 84
10,693	sheets	17 x 22	No. 25	Crane's Bond, white	288 71
11,293	sheets	17 x 28	20½-lb.	Certificate Bond, white	118 19
21,701	sheets	19 x 24	24½-lb.	Certificate Bond, white	225 96
294	sheets	17 x 28	25½-lb.	Certificate Bond, white	59
18,288	sheets	22 x 34	26-lb.	Certificate Bond, white	248 72
11,859	sheets	22 x 34	32-lb.	Certificate Bond, blue	161 73
6,600	sheets	22 x 34	32-lb.	Certificate Bond, buff	93 98
6,396	sheets	22 x 34	32-lb.	Certificate Bond, green	118 60
10,123	sheets	22 x 34	32-lb.	Certificate Bond, pink	144 15
206,960	sheets	22 x 34	32-lb.	Certificate Bond, white	2,842 03
65,717	sheets	22 x 34	40-lb.	Certificate Bond, white	1,117 19
13,788	sheets	22 x 34	32-lb.	California Bond, buff	282 08
4,192	sheets	22 x 34	32-lb.	California Bond, primrose	56 56
3,755	sheets	24 x 38	39-lb.	California Bond, pink	87 04
5,978	sheets	22 x 34	40-lb.	California Bond, blue	163 56
52	sheets	22 x 34	40-lb.	California Bond, white	1 42
7,500	sheets	22 x 34	40-lb.	California Bond, buff	178 20
22	sheets	17 x 22	16-lb.	Community Bond, buff	10
2,640	sheets	17 x 28	24-lb.	Community Bond, green	25 34
132	sheets	17 x 28	24-lb.	Community Bond, blue	1 27
20	sheets	17 x 28	24-lb.	Coupon (Colfe)	23
24,109	sheets	22 x 34	32-lb.	Dello Colored, pink	273 04
17,825	sheets	22 x 34	32-lb.	Dello Blue	201 88
3,470	sheets	17 x 28	20-lb.	English Bond, golden rod	48 66
210	sheets	17 x 28	20-lb.	English Bond, tuscan	93
6,060	sheets	17 x 28	20½-lb.	English Bond, primrose	80 50
10,000	sheets	17 x 28	20½-lb.	English Bond, buff	71 53
4,256	sheets	17 x 28	20½-lb.	English Bond, canary	35 75
9,133	sheets	17 x 28	20½-lb.	English Bond, pink	121 32
6,466	sheets	17 x 28	20½-lb.	English Bond, blue	85 89
6,525	sheets	17 x 28	20½-lb.	English Bond, opaline	86 68
3,053	sheets	22 x 34	24-lb.	English Bond, canary	61 26
6,672	sheets	22 x 34	24-lb.	English Bond, blue	117 47
269	sheets	22 x 34	24-lb.	English Bond, pink	4 73
5,030	sheets	22 x 34	24-lb.	English Bond, golden rod	107 04
11,165	sheets	22 x 34	32-lb.	Excelsior, white	113 43
4,921	sheets	22 x 34	32-lb.	English, golden rod	99 21
31	sheets	22 x 34	32-lb.	English, pink	58
3,718	sheets	22 x 34	32-lb.	English, gray	49 97
430	sheets	22 x 34	32-lb.	English, blue	7 57
1,610	sheets	22 x 34	32-lb.	English, russet	25 76
14,769	sheets	22 x 34	32-lb.	English, canary	247 70
2,770	sheets	22 x 34	32-lb.	English, cherry	46 02
252	sheets	24 x 38	39-lb.	English, pink	4 82
1,740	sheets	24 x 38	29-lb.	English, canary	35 98
7,542	sheets	22 x 34	40-lb.	English, canary	179 08
1,411	sheets	22 x 34	40-lb.	English, pink	23 72
3,268	sheets	22 x 34	40-lb.	English, buff	54 00
23,490	sheets	22 x 34	40-lb.	Excelsior, white	208 32
16,000	sheets	28 x 34	51-lb.	Excelsior, white	259 08
979	sheets	17 x 28	16½-lb.	Exchange, white	13 73
880	sheets	22 x 34	32-lb.	Exchange, white	14 71
7,180	sheets	28 x 34	33-lb.	Exchange, white	201 36
56	sheets	22 x 34	40-lb.	Exchange, white	1 24
352	sheets	17 x 22	20-lb.	Fairfield Parchment, linen finish	4 22
153	sheets	22 x 34	32-lb.	Hammermill, primrose	2 73
53	sheets	17 x 22	20-lb.	Hickory, blue	36
13	sheets	17 x 28	20-lb.	Library, blue	04
-14	sheets	17 x 28	20-lb.	Library, pink	04
9,962	sheets	28 x 44	40-lb.	Map Bond, white	323 77
11,339	sheets	17 x 28	13-lb.	Mercantile Bond, white	155 12

INVENTORY OF STOCK, JUNE 30, 1919—Continued.

110	sheets	17 x 22	16-lb.	National Bank Bond, primrose.	1 48
4,000	sheets	22 x 34	25-lb.	National Bank Bond, buff.	54 97
165	sheets	25 x 38	40-lb.	National Bank Bond, blue.	1 53
1,739	sheets	17 x 28	20-lb.	Orient, canary	13 74
23,378	sheets	17 x 28	25-lb.	Orient, white	305 82
500	sheets	25 x 38	40-lb.	Orient, white	9 53
198	sheets	17 x 28	20-lb.	Roman, opaline	1 47
9	sheets	17 x 28	20-lb.	Roman, emerald	07
615	sheets	17 x 22	16-lb.	Reliance, green	2 95
80	sheets	19 x 24	20-lb.	Reliance, blue	28
290	sheets	17 x 22	20-lb.	Reliance, green	1 45
175	sheets	17 x 22	20-lb.	Reliance, primrose	84
1,912	sheets	24 x 38	40-lb.	Reliance, buff	34 31
5,373	sheets	17 x 22	8-lb.	Superior Manifold, white	44 49
11,135	sheets	17 x 22	8-lb.	Superior Manifold, blue	100 21
1,820	sheets	17 x 28	10-lb.	Superior Manifold, white	10 92
245	sheets	17 x 28	10-lb.	Superior Manifold, blue	1 47
804	sheets	19 x 24	20-lb.	Standard, opaline	4 82
18,659	sheets	17 x 28	20-lb.	Standard, white	291 64
5,517	sheets	17 x 22	10-lb.	Strathmore, white	68 41
58	sheets	17 x 28	No. 21	Strathmore, white	73
72	sheets	19 x 24	No. 21	Strathmore, white	60
185	sheets	17 x 22	28-lb.	Tellman Ex. Super Bond, blue	2 79
3,935	sheets	22 x 34	32-lb.	Tisrite, opaline	65 48
2,500	sheets	22 x 34	40-lb.	Tisrite, opaline	41 60
3,450	sheets	22 x 34	40-lb.	Tisrite, linen finish	66 24
39	sheets	17 x 28	20-lb.	Trust, green	45
2,185	sheets	22 x 34	32-lb.	Trust, peach	31 55
470	sheets	22 x 34	40-lb.	Trust, buff	3 76
6,331	sheets	25 x 38	51-lb.	Trust, white	165 40

\$11,553 63

Cover Paper.

12	sheets	22½ x 28½	90-lb.	Antique Princess, gray	1 20
22,577	sheets	20 x 25	65-lb.	Buckeye, India	587 89
11,552	sheets	20 x 25	65-lb.	Buckeye, French gray	300 81
288	sheets	20 x 25	65-lb.	Buckeye, buff	7 50
1,736	sheets	20 x 25	65-lb.	Buckeye, scarlet	45 20
363	sheets	20 x 25	65-lb.	Buckeye, pink	9 45
391	sheets	20 x 25	65-lb.	Buckeye, dark green	10 18
273	sheets	20 x 25	65-lb.	Buckeye, primrose	7 11
120	sheets	22½ x 28½	80-lb.	Buckeye, azure	3 54
22	sheets	22½ x 28½	80-lb.	Buckeye, Nile	65
4,767	sheets	22½ x 28½	80-lb.	Buckeye, India	140 82
64	sheets	22½ x 28½	80-lb.	Buckeye, dark gray	1 90
3,157	sheets	22½ x 28½	80-lb.	Buckeye, French gray	93 26
1,490	sheets	22½ x 28½	80-lb.	Interwoven, antique finish	40 77
983	sheets	22 x 28	80-lb.	Greenway, London smoke	19 68
28	sheets	20 x 25	60-lb.	Kermes, green	44
595	sheets	17 x 31	37-lb.	Manuscript, chocolate	11 30
297	sheets	18 x 31	40-lb.	Manuscript, emerald	7 53
4,000	sheets	18 x 31	40-lb.	Manuscript, primrose	101 46
9,155	sheets	18 x 31	40-lb.	Manuscript, blue	232 22
72	sheets	18 x 31	40-lb.	Manuscript, chocolate	1 83
16	sheets	22 x 28½	75-lb.	Middlesex, green	21
56	sheets	2-ply	Modern, brown ripple	2 80	
457	sheets	20 x 25	65-lb.	Old Cloister	15 53
63	sheets	22½ x 28½	75-lb.	Pickwick	1 48
98	sheets	60-lb.	Crash finish	1 47	
57	sheets	22½ x 28½	90-lb.	Princess, purple	5 69
72	sheets	20 x 25	35-lb.	S. & S. C., straw	33
125	sheets	20 x 25	35-lb.	S. & S. C., opaline	58
104	sheets	20 x 25	35-lb.	S. & S. C., cherry	48
172	sheets	20 x 25	50-lb.	S. & S. C., India	2 53
200	sheets	20 x 25	50-lb.	S. & S. C., green	2 83
95	sheets	22 x 28	60-lb.	S. & S. C., Mandarin	51
13,000	sheets	20 x 25	50-lb.	S. & S. C., fawn	190 66
3,732	sheets	20 x 25	50-lb.	S. & S. C., pearl	54 74
12,945	sheets	20 x 25	50-lb.	S. & S. C., granite	189 86
13,068	sheets	20 x 25	65-lb.	S. & S. C., fawn	259 92
40	sheets	20 x 25	60-lb.	S. & S. C., blue	61

\$2,855 47

INVENTORY OF STOCK, JUNE 30, 1919—Continued.

Cardboard.

4,437	sheets 2-ply 22½ x 28½	Bristol, white	\$218 27
578	sheets 3-ply 22½ x 28½	Bristol, white	32 27
84	sheets 3-ply 22½ x 28½	Colored Bristol, fawn	3 38
305	sheets 3-ply 22½ x 28½	Bristol, gray	12 25
19	sheets 3-ply 22½ x 28½	Bristol, pearl	76
1,277	sheets 3-ply 22½ x 28½	Bristol, pink	63 04
538	sheets 3-ply 22½ x 28½	Bristol, canary	27 12
257	sheets 3-ply 22½ x 28½	Bristol, salmon	10 32
771	sheets 3-ply 22½ x 28½	Bristol, green	37 01
12,392	sheets 4-ply 22½ x 28½	Bristol, white	814 16
41	sheets 4-ply 22½ x 28½	Index Bristol, green	1 38
11	sheets 6-ply 22½ x 28½	Bristol, white	78
265	sheets 110-lb. 25½ x 30½	Gibraltar Index Bristol	9 94
1,139	sheets 110-lb. 25½ x 30½	R. & C. Index Bristol, buff	51 87
5,000	sheets 110-lb. 25½ x 30½	Defiance Index Bristol, white	304 00
186	sheets 110-lb. 25½ x 30½	R. & C. Index Bristol, white	11 30
406	sheets 110-lb. 25½ x 30½	R. & C. Index Bristol, blue	27 40
1,082	sheets 120-lb. 22½ x 28½	Bristol, cherry	43 45
491	sheets 120 lb. 22½ x 28½	Bristol, light blue	19 72
244	sheets 140-lb. 25½ x 30½	Defiance Index Bristol, blue	18 52
1,087	sheets 140 lb. 25½ x 30½	Index Bristol-Defiance, buff	82 49
1,032	sheets 140-lb. 25½ x 30½	Gibraltar Index Bristol, white	76 79
418	sheets 140-lb. 25½ x 30½	Acme Index Bristol, cherry	31 72
514	sheets 140-lb. 25½ x 30½	Acme Index Bristol, salmon	59 00
5,000	sheets 140-lb. 25½ x 30½	Defiance Index Bristol, white	391 50
200	sheets 170-lb. 25½ x 30½	Gibraltar Index Bristol, white	14 50
200	sheets 170-lb. 25½ x 30½	Gibraltar Index Bristol, buff	14 50
400	sheets 220-lb. 25½ x 30½	R. & C. Index Bristol, blue	40 40
506	sheets 220-lb. 25½ x 30½	index Bristol	51 19
477	sheets 220-lb. 25½ x 30½	Acme index Bristol, white	42 60
507	sheets 220-lb. 25½ x 30½	Acme index Bristol, salmon	45 28
173	sheets 100-lb. 22½ x 28½	tag board	2 42
4	sheets 110-lb. 22½ x 28½	tag board	03
3,237	sheets 120-lb. 22½ x 28½	iron tag board	111 87
1,776	sheets 140-lb. Manila	tag board	49 79
49	sheets 150-lb. 22½ x 28½	Manila tag board	1 03
432	sheets 160-lb. tag board		24 18
133	sheets 160-lb. Manila tag board		2 66
1,533	sheets 180-lb. 22½ x 28½	tag board	49 05
206	sheets 3-ply 22 x 28	tough check, coral	10 48
373	sheets 3-ply 22½ x 29½	tough check, green	18 99
910	sheets 3-ply 22 x 28	tough check, buff	46 32
393	sheets 3-ply 22½ x 28½	tough check, white	20 00
463	sheets 3-ply 22½ x 28½	tough check, lemon yellow	23 57
406	sheets 3-ply 22½ x 28½	tough check, blue	20 67
1,055	sheets 3½-ply 22½ x 28½	tough check, red	70 53
16	sheets 3½-ply 22 x 28	tough check, green	88
307	sheets 3½-ply 22½ x 28½	tough check, pearl	16 88
94	sheets 4-ply 22½ x 28½	tough check, yellow	6 11
14	sheets 4-ply 22 x 28	tough check, red	01
3	sheets 4-ply 22 x 28	tough check, orange	19
20	sheets 4-ply 22 x 28	tough check, white	1 30
1,121	sheets 6-ply railroad board, red		110 41
161	sheets 6-ply railroad board, green		5 43
177	sheets 6-ply railroad board, blue		5 97
189	sheets 6-ply railroad board, coral		6 37
228	sheets 6-ply 22 x 28 railroad board, salmon		7 69
89	sheets 6-ply 22 x 28 railroad board, tea		3 00
212	sheets 6-ply 22 x 29 railroad board, lemon yellow		7 15
59	sheets 6-ply 22 x 28 railroad board, buff		1 99
28	sheets 22 x 28 China board, orange		84
34	sheets 22 x 28 China board, blue		1 02
3	sheets 22 x 28 China board, green		09
80	sheets 22 x 28 China board, buff		2 40
110	sheets 22 x 28 China board, salmon		3 30
54	sheets 22 x 28 China board, yellow		1 68
16	sheets 22 x 28 China board, light red		48
17	sheets 22 x 28 China board, pink		51
25	sheets 22 x 28 China board, dark blue		75
990	sheets 8-ply 22½ x 28½	Aetna blanks	79 38
11,463	sheets size 2, Mercantile stock cards, buff		94 57
608	sheets 4510 E guides 1/5th ends, blue		5 47
358	sheets 4510 E guides 3rds centers, buff		3 22
58	sheets 220-lb. Gibraltar index, blue		8 33

INVENTORY OF STOCK, JUNE 30, 1919—Concluded.

Miscellaneous.

230	sheets 19 x 24 120-lb. blotting paper	\$3 91
217	sheets 17 x 22 56-lb. Crane's artificial parchment	25 77
3,833	sheets 20 x 25 Non-curl gum paper, assorted colors	32 27
12,448	sheets 17 x 22 Non-curl gum paper	201 25
8	sheets 5 x 8 genuine parchment paper	1 91
5,095	sheets French Folio, unglazed, yellow	19 63
7,963	sheets 17 x 22 French Folio, unglazed, white	30 68
7,450	sheets 17 x 28 French Folio, unglazed, pink	40 97
7,500	sheets 22 x 34 French Folio, unglazed, white	65 56
5,594	sheets 17 x 28 French Folio, unglazed, blue	30 77
7,434	sheets No. 1 French Folio, unglazed, pink	28 64
1,977	sheets 17 x 22 French Folio, unglazed, green	7 62
9,900	sheets 17 x 22 French Folio, unglazed, cherry	38 14
963	sheets 17 x 22 French Folio, glazed, cherry	3 71
966	sheets 17 x 22 French Folio, glazed, green	8 72
2,640	sheets 22 x 34 No. 1 French Folio, glazed, white	18 75
2,500	sheets 17 x 22 French Folio, glazed, yellow	9 63
5,770	sheets 19 x 24 French Folio, tissue paper	22 03
24	sheets 14 x 10½ imitation parchment	1 04
3,689	sheets 17 x 28 National Safety Paper, primrose	89 13
4,852	sheets 17 x 28 National Safety Paper, pink	117 22
2,309	sheets 17 x 28 National Safety Paper, green	55 79
1,500	sheets 17 x 28 National Safety Paper, stone	36 24
14	sheets 17 x 28 National Safety Paper, green	34
184	sheets 17 x 28 National Safety Paper, blue	4 45
1,217	sheets 17 x 22 typewriter onion skin	4 09
750	sheets No. 1 30 x 30 make ready tissue	4 88
93	sheets 17 x 28 Bankers Safety Paper, stone	2 24
1,696	sheets 17 x 28 Bankers Safety Paper, blue	40 97
6,775	sheets 20 x 26 glazed paper, assorted colors	63 00
4,215	sheets 17 x 22 Franklin Onion Skin	16 24
3,375	sheets 30 x 30 Grass Bleached Tissue, silver	10 37

\$1,037 55

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Seventh Biennial Report

OF THE

Department of Engineering

OF THE

State of California

1919-1920

W. F. McCLURE
State Engineer



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1921

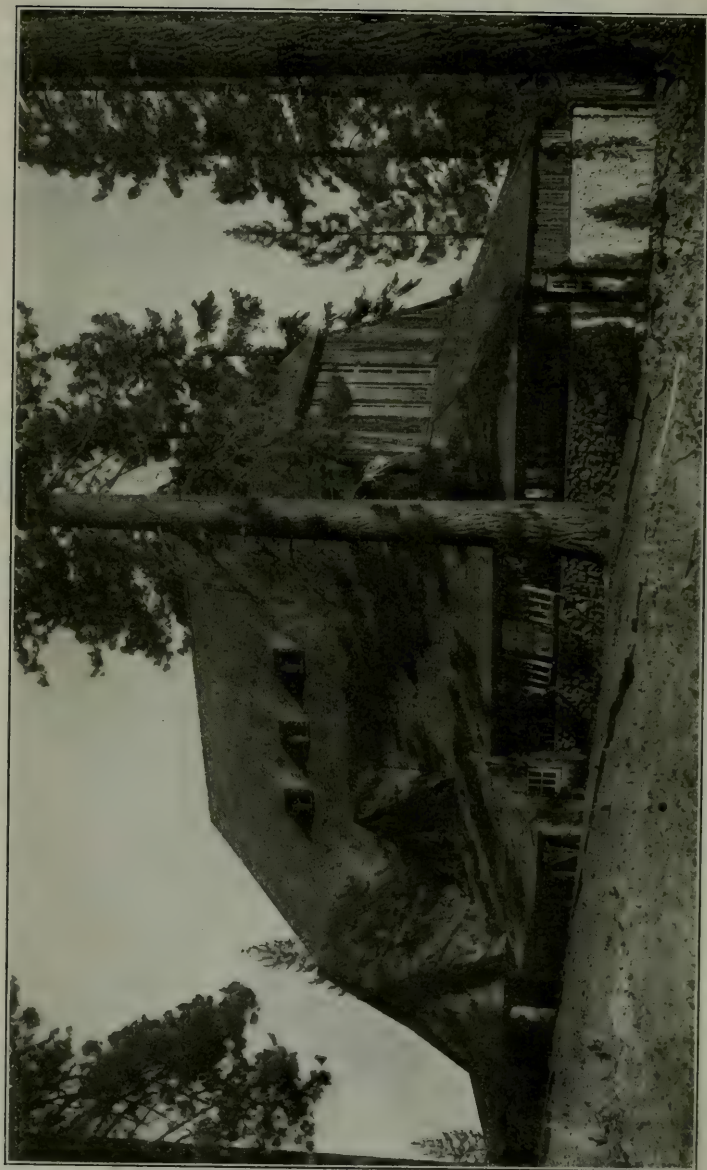


PLATE I. State Fish Hatchery, Lake Tahoe.

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LETTER OF TRANSMITTAL.

STATE OF CALIFORNIA. DEPARTMENT OF ENGINEERING.

SACRAMENTO, November 30, 1920.

*Honorable WILLIAM D. STEPHENS,
Governor of California,
State Capitol,
Sacramento, California.*

MY DEAR GOVERNOR: Knowing that you are too busy to spare time to read a voluminous document, in presenting this the Seventh Bien-nial Report of the Department of Engineering, I take the liberty of calling attention to some of its salient features.

In addition to having all architectural and engineering work at forty-nine state institutions the Department is specially directed by law to do these things:

To conduct research and design works for the protection of lands from floods. This has been done in cooperation with Army engineers for the Sacramento Valley, and alone in Mad River Valley, in both of which the object is being accomplished. The Department is making the necessary studies preparatory for flood control and reclamation of flooded lands of the San Joaquin Valley. It has worked out a plan for the utilization of flood waters in Coachella Valley, Riverside County, and published a report thereon. A district is now building the works. A report on the flood problems of the Calaveras River has been published, which is being made the basis for the organization of a project by the people of Stockton involving an estimated cost of \$1,500,000.

To study the feasibility of constructing navigable canals in the valleys and of canalizing the rivers.

In cooperation with the Sacramento Chamber of Commerce the Department has made a survey for a ship canal connecting Sacramento with deep water. Its studies show that canalization of many streams can be accomplished, but canals can also be built at less expense and operated with a tithe of the water required for the rivers, which water is needed for irrigation. For lack of funds no details have been worked out.

To catalog the water resources of the state. In cooperation with the Hydrographic branch of the United States Geological Survey, daily record is kept of the discharge of most of the larger streams of the state.

During the last three years the streams have afforded about sixty-six per cent of the usual summer flow. Taking Sacramento Valley, for example, the flow of all of the streams entering the valley last summer amounted to 37 per cent of the quantity that would have been required to irrigate one-half the irrigable area of the valley.

Navigation was suspended on portions of the river and was extremely difficult even below Sacramento. And yet in the preceding winter nearly three times as much water went to waste as would have been required for all purposes during the summer.

The remedy is storage. The Department has accumulated some data on that subject. In cooperation with the government and other parties it has obtained a complete survey of the Iron Canyon project including borings for a dam location. Two hundred and twenty-five thousand acres now without water can be irrigated from this source. A similar survey was made for a reservoir on Calaveras River where water can be stored for 50,000 acres.

Funds are needed to examine other sites on nearly every stream system in the state.

The Department has examined many projects for building dams, and has prescribed changes in the plans looking to safety for the public.

The Department is also engaged in working out a method of snow surveys by which a forecast can be made in the Spring of the quantity of run-off that may be expected later. This will be of inestimable assistance in preparation for coming floods or drouths.

In cooperation with the federal government, a detail map is being made of the entire state and about 75 per cent is now covered. Maps are published of the surveyed areas showing every 100 feet of elevation in the mountains and 5 feet elevations in the valleys. Sacramento Valley is completed and the survey in San Joaquin Valley has reached Tulare County.

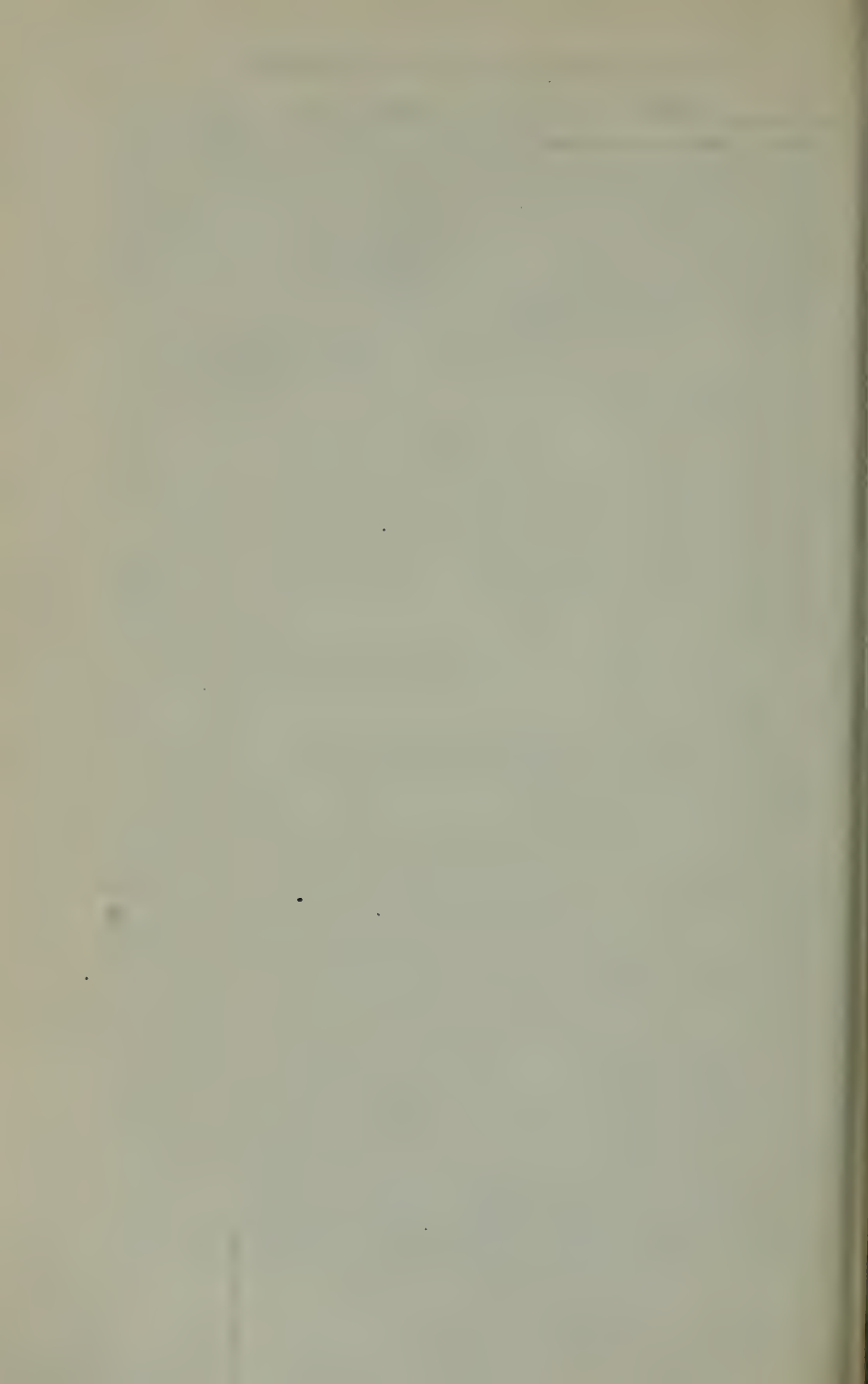
In cooperation with the United States Department of Agriculture and the University of California studies and experiments are constantly being made in irrigation methods. As a result the "duty" of water is being raised so that the same results are obtained with much less water applied.

In view of the close relations established between the Department and cooperating agencies whereby duplication of work is avoided, and since the Department has a staff of highly trained experts in the line

of research required, it is plain that the Department of Engineering is the logical agency of state to make all kinds of investigations concerning its water resources, and that in those matters of urgency above outlined the Department should have adequate financial support. We believe that if the appropriation of \$150,000 to \$200,000 usually made for the river work assigned to the Department should be increased to \$350,000 it will be able to cover the field of investigations with better results than could be done by any other agency.

Very truly yours,

W. F. McCLURE,
State Engineer.



SEVENTH BIENNIAL REPORT OF THE DEPARTMENT OF ENGINEERING OF THE STATE OF CALIFORNIA, 1919-1920.

INTRODUCTION.

In presenting this, the Seventh Biennial Report of the Department of Engineering, it is deemed proper to invite special attention of the Executive and the Legislature to certain matters contained herein.

When this country became involved in a war the culmination of which meant the survival or fall of democratic governments throughout the world, the employees of the Department of Engineering were not behind any other aggregation of citizens in showing their patriotism.

Forty-six per cent of the male force answered the call. They were given indefinite leaves of absence with assurances that their positions would be open for them on their return.

It is gratifying to those who remained to know that though many of those who joined the colors were included in the expeditionary forces, none was sacrificed, and only two received wounds, neither of whom was seriously injured.

Those who for one reason or another were not selected for war service, remained at their posts, assumed the duties of the missing ones, and uncomplainingly performed extra work in order that their absent companions' vacant places should not be filled until the rightful claimants might return.

When peace came and the armies were disbanded most of the absentees returned and were welcomed to their old position. But conditions had changed. They found the cost of living had nearly doubled. Compensation paid in private employment had greatly increased, and the law governing the department together with the condition of its finances forbidding any adequate advance in salaries, only about one-third of the returning force could be induced to reenter the service of the state.

The same conditions continuing to prevail since peace came the Department has not been able to recruit its forces to pre-war numbers, and much of its activities has suffered.

In this connection it is desired to call attention with strong emphasis to the fact that the salaries of officers and employees of the Department which are defined by statute were fixed by the Legislature many years ago when living expenses were not half as much as they are now. The character of the duties of some employees has changed and the responsibilities thereof greatly increased, so that it is extremely difficult to

obtain or to hold men of the requisite ability in positions receiving inadequate compensation.

It is submitted that the work of the Department is of too great importance to the welfare of the state to be sacrificed to a policy of false economy and the Executive and Legislature are urged to see to it that ample funds be provided to enable the Department to properly perform its functions and accomplish the various duties assigned to it in a manner befitting an important branch of the state government.

RECOMMENDATIONS.

It is submitted to the Executive and Legislature that in the interests of efficiency the statute governing the organization of the Department of Engineering should be amended by eliminating those provisions which name subordinate positions, i. e., so-called "statutory positions," and fixing their compensation.

Rather, the Department, having recourse to the advice of the Board of Control and State Controller should be free to designate the positions of its various employees and to fix their compensation in accordance with the ability and responsibility required of each.

The consideration of the Executive and the Legislature is earnestly invited to the discussion herein of the water problems and the serious conflicts which are arising between irrigation and navigation interests, and between communities of water users themselves.

The causes of these unfortunate conflicts are set forth, in which it is clearly shown that the normal summer flow of all the streams entering the Sacramento Valley during an average year is not enough to irrigate one half of the lands needing irrigation and during a series of dry years a much less proportion can be supplied.

It is pointed out that the remedy for water shortage is storage of winter flood waters, but that comparatively little reliable data exists as to the location and physical features of possible reservoir sites.

It is also shown that navigation on the Sacramento and San Joaquin rivers is an important factor in the development and prosperity of the great interior of the state, and that while the Department of Engineering is charged by law to investigate means of extending the water transportation, it has not been able to do much effective work in that line because of lack of funds.

It is submitted that the Department of Engineering is the logical agency of the state to make the investigations needed; it has a staff of trained experts who have shown their loyalty to the state by remaining in its employ under trying conditions and if the Department can continue them upon its roster it can pledge to the state a continuance of faithful and efficient service.

PART I.

REPORT OF THE DEPARTMENT OF ENGINEERING.

HISTORICAL.

The Department of Engineering was created by an act of the Legislature approved March 11, 1907 (chapter 183, Statutes 1907) and was organized in the May following.

Mr. Nathaniel Ellery was appointed to the position of State Engineer and chief executive officer of the Department of Engineering, and assumed the office May 11, 1907. He was succeeded in office by the appointment of Mr. Wilbur F. McClure, incumbent, February 13, 1912.

The records of the organization of the Department and the work accomplished by it from the date of its establishment to November 30, 1918, have been published in the reports heretofore issued every two years, and it is the purpose of this report to review the operations of the department during the biennial period just closing.

Since the Department was created, each session of the Legislature has enacted laws amending the statutes affecting the work of the Department, the most notable of which have been the placing in the Department the supervision of the design and construction of dams; the examination of proposed irrigation district projects and the supervision, with the bond commission, of the issue of irrigation bonds thereunder; the administration of the state highway acts involving the expenditure of \$73,000,000 for the construction of the state highways.

DEPARTMENT OF ENGINEERING.

Under the statutes now in force the Department of Engineering is composed of two bodies: Advisory Board and Executive Force. These two bodies are constituted respectively as follows:

The Advisory Board.

Governor, ex officio member and chairman.

General Superintendent of State Hospitals, ex officio member.

Chairman of Board of State Harbor Commissioners of San Francisco
ex officio member.

Three members, appointed by the Governor.

The Advisory Board is the administrative head, and directs the operations of the Department through the State Engineer, who is the chief executive officer of the Department.

The ex officio members receive no salary as members of the Advisory Board. The three last-named appointed members of the Advisory Board are delegated as a special executive committee of the board to

administer the state highways, and bear the title of State Highway Commission. These members receive salaries.

Executive Force.

This body is composed of two classes of employees, which for convenience are designated as "statutory" and "nonstatutory" employees. The first-named class are those enumerated by the laws which authorize the Department of Engineering to appoint the following:

- Highway Engineer.
- Chief Engineer for the Board of State Harbor Commissioners (San Francisco).
- Two Assistant Engineers.
- Secretary.
- State Architect.
- Auditor.
- General Superintendent for the Architectural Division.
- Mechanical Engineer.
- Structural Engineer.
- Electrical Engineer.
- Architectural Designer.
- Three Architectural Draftsmen.
- Engineer's Draftsman.
- Estimator.
- Specification Writer.
- Blueprint Pressman.
- Two Clerks.
- Two Stenographers.
- Janitor.

These, with the State Engineer as chief executive officer, comprise the "statutory" force. Their salaries are paid from the fund created by the "General Appropriation Act."

The field of operations of the Department of Engineering is so extensive and its activities so varied that the above-enumerated statutory force is not sufficient to properly conduct the work of the Department and must be augmented by additional assistants appointed from time to time as exigencies arise requiring their services. Their compensation is paid, usually, from the appropriations made to cover the particular work for which they are engaged. When no such appropriation exists they are paid from the Department's contingent fund.

The force of "nonstatutory" employees includes engineers and architects, designers, draftsmen, inspectors, etc., engaged in building operations; engineers, surveyors, inspectors and others required to design and construct waterworks and sewerage plants, etc., at the state institutions; engineers, surveyors, hydrographers, boatmen, foremen, cooks and laborers employed in control and improvement of river channels; engineers and special examiners to investigate bridges, dams and irrigation projects, together with an army of people engaged in the varied operations of the Highway Commission.

DUTIES OF THE DEPARTMENT.

The above list of employments indicates to some extent the varied nature of the Department's activities and the extent of the field covered by it. Its duties, as specified by several statutes, are summarized as follows:

To make plans and specifications for all buildings at the various state institutions, to let contracts for and superintend their erection, or, in case satisfactory contracts cannot be made, to construct the buildings by day labor. To design and install all heating, lighting, ventilating, refrigerating, water supply, sewerage, and mechanical plants of every nature—whether changes, extensions or original. Survey grounds, lay out walks, drives and roads; provide water supply, irrigation, reclamation, sewer and drainage systems requiring the design and construction of dams, reservoirs, pipe lines, wells, pumping plants, ditches, sewage treatment and disposal plants and drains.

Design and construct works for the protection of river levees, preservation of navigation and protection from floods.

Conduct research looking to the reclamation of the overflow basins and to effect flood control on the Sacramento and San Joaquin and other rivers of the state.

Studies of the feasibility of navigable canals and canalization of rivers.

Through the engineering force assigned to the Board of Harbor Commissioners, to design and direct the construction of wharves, piers, buildings and their equipment on the water front of San Francisco.

Through the Highway Commission the construction and maintenance of the state highways, authorized by the state highway bond acts, and the improvement, repair and maintenance of more than 600 miles of state roads in the mountains.

By cooperation with the federal government a topographic survey of the state is being made; daily measurements are made of the water flowing in all the principal and many of the minor streams of the state; studies of possibilities for developments of power in the mountains and irrigation in the plains. Investigation of the quantity of water required for various crops, methods of applying it, waste in the use of water, etc.

This Department is required to cooperate with the engineers of the War Department in matters concerning debris control, flood control and aids to navigation.

Supplemental to the investigation of stream flow for flood control and utilization, the Department is engaged in the determination of water stored in the great snow fields of the mountains and the study of meteorological phenomena affecting the run-off.

The State Engineer is required to investigate and pass upon the feasibility of the enterprise before an irrigation district can be organized, and as a member of the District Bond Commission approve plans and determine the cost of proposed works as bases for bond issues as well as the validation of bonds when issued; to keep a general supervision of construction of irrigation works executed under bond issues. Also to perform the same offices in connection with the issue of bonds by county water works districts.

He is ex officio a member of the State Water Commission, which body has control of all water appropriations and the ascertainment of water rights. He is also a member of the Carey Act Land Board.

The State Engineer is required by law to direct the engineering investigations for the Reclamation Board to determine the proper location and sufficiency of proposed reclamation works, so that they shall conform to the plan for flood control adopted by the state.

Plans for all bridges across navigable streams are required to be approved by the State Engineer before they are permitted to be erected. The law directs that he shall pass upon plans, specifications and estimates of all dams constructed in the state, not specifically exempted.

The Department has been called upon by municipalities for advice in regard to sewage disposal by communities asking for advice regarding flood protection and stream control in different portions of the state. While these are not duties enjoined by law upon the Department, the State Engineer has always responded to such requests and given such assistance in an advisory way as the Department was able to furnish, and it is gratifying to know that such aid has been regarded of value by the recipients.

When this country became involved in the great world war, the State Engineer and the Department were called upon by state and federal officials for aid in matters connected with the prosecution of the war. Such work as the Department could do was placed ahead of any other and its best energies devoted to the service of the country.

ORGANIZATION.

As previously stated, the department is divided into branches to handle each different kind of work. These branches are termed-bureaus. The executive head of each bureau is called the director. He reports directly to the State Engineer.

The bureaus as now established are as follows:

- I. General Office Bureau.
- II. Bureau of Architecture.
- III. Bureau of Economics.
- IV. Bureau of Highways.

I. The General Office Bureau conducts the business of the Department relating to all other branches, such as keeping the records and archives, accounts, contracts and payments, legislation, janitor and messenger service, etc.

II. The Bureau of Architecture, as its name implies, designs and constructs all state buildings.

Plans for water supply, for sewerage, irrigation, drainage and reclamation, roads and bridges, topographic surveys of grounds and surveys of land boundaries for all state institutions are entrusted to this bureau.

III. The Bureau of Economics has charge of all matters pertaining to hydraulics, such as irrigation, stream measurement, flood control reclamation, drainage and navigation. It acts in an advisory capacity with the Bureau of Architecture in matters pertaining to water supply and other engineering service at state institutions.

Supervision of dams and bridges is exercised through this bureau.

This bureau also has charge for the state of cooperative topographic surveys, hydrology, meteorology and irrigation investigations, debris control and inland navigation.

IV. That branch of the department designated herein as Bureau of Highways was created for the purpose of carrying out the highway bond acts.

This duty it has performed since 1911. In 1917 the office of state roads (having charge of the mountain roads) was transferred to this bureau.

The Highway Bureau has so large a task requiring such a complete organization for one specific purpose, that it almost constitutes a separate department. It is, however, a part of the Department of Engineering and is administered through the direction of members of the Advisory Board delegated to that duty.

PERSONNEL.

At the date of this writing, November 1, 1918, the Department of Engineering is organized as follows:

Advisory Board.

William D. Stephens.....Governor (Chairman)
 W. F. McClure.....State Engineer
 J. H. McCallum.....President State Board of Harbor Commissioners
 F. W. Hatch.....General Superintendent of State Hospitals
 N. D. Darlington (chairman), Chas. A. Whitmore, Geo. C. Mansfield..State Highway Commission

Executive Office.

Title	Name	Entered service
State Engineer.....	W. F. McClure.....	Feb. 12, 1912
Secretary	"	

*Earl Freeman resigned September 30, 1920.

General Office Bureau.

Secretary of Department.....Director

Title	Name	Entered service
Division of correspondence—		
Secretary, chief.		
Stenographer	Mrs. Lucy A. Bishop.....	April 1, 1912
Stenographer	Mrs. Jenneav V. Rosecrans.....	Aug. 11, 1920
Stenographer	Miss Elsa Koch.....	Mar. 25, 1914
Telephone operator.....	Mae L. Cheshire.....	July 15, 1920
Filing and shipping clerk.....	A. H. Henderson.....	July 29, 1920
Messenger	Robert Moore.....	Mar. 20, 1920
Division of accounts—		
Auditor, chief.		
Auditor	J. H. Clarke.....	Nov. 11, 1911
Bookkeeper	Chas. Johnston	July 8, 1907
Bookkeeper	J. C. McCalmont.....	Mar. 26, 1912
Bookkeeper	Thos. McCully	Feb. 1, 1915
Clerk	*	
Clerk	Lester Stern	Mar. 1, 1920
Clerk	J. A. Brown.....	Feb. 3, 1920
Stenographer	Zae Adams	Sept. 29, 1919

*N. E. White entered service April 15, 1912, died July 22, 1920.

Bureau of Architecture.

State Architect.....Director

Title	Name	Entered service
Director's office—		
State Architect	Geo. B. McDougal	Aug. 22, 1913
Deputy State Architect	Geo. J. Adams	Aug. 15, 1915
Blueprinter	Frank Butler	April 1, 1912
Architectural Division—		
Deputy State Architect, chief.		
Assistant State Architect	A. H. Memmler	Jan. 10, 1913
Superintendent of Construction	J. W. Dutton	Oct. 1, 1912
Chief Designer	Chas. F. Dean	Sept. 23, 1911
Architectural designer	R. E. Backus	Sept. 1, 1912
Architectural designer	Ward Dwan	Nov. 1, 1917
Architectural draftsman	H. V. Adams	June 20, 1919
Architectural draftsman	H. J. Devine	Aug. 2, 1917
Architectural draftsman	Carleton Pierson	Jan. 20, 1913
Architectural draftsman	Leroy F. Sherwood	Jan. 1, 1913
Architectural draftsman	S. R. Davies	Aug. 27, 1919
Chief estimator	C. K. Aldrich	Mar. 13, 1914
Estimator	J. G. Heath	Feb. 1, 1913
Engineering division—		
Chief Engineer, chief.		
Chief Engineer	A. Givan	Apr. 1, 1920
Chief structural engineer	Clarence H. Kromer	Feb. 16, 1913
Structural draftsman	Walter J. Long	Nov. 12, 1912
Engineer's draftsman	R. P. Adams	Aug. 1, 1919
Mechanical engineer	L. E. Rushton	July 6, 1915
Mechanical draftsman	D. H. McMillan	Oct. 1, 1914
Mechanical draftsman	W. H. Epperson	Dec. 26, 1917
Mechanical draftsman	C. A. Henderlong	Apr. 28, 1914
Chief electrical engineer	G. M. Simonson	Sept. 22, 1913
Electrical engineer	Paul Duncckhorst	Aug. 6, 1920
Electrical draftsman	G. E. Garthorne	Oct. 1, 1919
General electrical foreman	G. N. Sargent	Aug. 1, 1917
Civil engineer	Wm. K. Potts	July 14, 1919
Engineer assistant	A. J. Beakey	June 10, 1912

Bureau of Economics.

Chief Assistant State Engineer.....Director

Title	Name	Entered service
Chief Assistant State Engineer.....	Paul M. Norboe.....	May 17, 1907
Flood Control and Reclamation Division—		
Chief Assistant State Engineer, chief.		
Flood control engineer.....	E. A. Bailey.....	June 1, 1912
Office engineer.....	J. E. Tempest.....	Jan. 1, 1920
Hydrographer.....	H. L. McCready.....	May 21, 1919
Engineer's draftsman.....	Glen Rood.....	Aug. 6, 1920
Engineer's draftsman.....	F. B. Hilby.....	May 1, 1920
Engineer's assistant.....	C. W. Nawmann.....	Mar. 16, 1920
Navigation Division—		
Chief Assistant Engineer, chief.		
Chief engineer, San Francisco harbor.....	Frank G. White.....	July 7, 1916
Hydrographer.....	Harry A. Armstrong.....	June 26, 1918
Superintendent, river work.....	W. W. Wooldridge.....	Jan. 1, 1908
Foreman, river work.....	Frank E. Wooldridge.....	Sept. 1, 1909
Foreman.....	John H. Gibson.....	July —, 1920
Timekeeper.....	J. Nevin.....	Mar. —, 1920
General roustabout.....	H. Wicks.....	1916
Irrigation Division—		
Chief Assistant State Engineer, chief.		
Assistant state engineer.....	J. B. Brown.....	June 26, 1913
Assistant state engineer.....	S. C. Whipple.....	May 10, 1920
Project examiner.....	W. L. Huber.....	Special
Project examiner.....	Harry Barnes.....	Special
Project examiner.....	S. T. Harding.....	Special
Division of Cooperative Research—		
Chief Assistant State Engineer, chief.		
United States Geological Survey—		
Topographic.....	Geo. A. Davis.....	
Hydrographic.....	H. D. McGlashan.....	
United States Department of Agriculture—		
Irrigation inquiry.....	{ Dr. Samuel Fortier.....	
	{ Frank Adams.....	

Bureau of Highways.

California Highway Commission.....Director
State Highway Engineer.....Austin B. Fletcher, Executive Officer

NOTE.—The personnel of this bureau is so large that it is necessarily omitted and for information concerning it the reader is referred to the records and separate reports of the Highway Commission.

MEMORIAM.

Died, July 22, 1920, Nicholas Edward White.

In the death of N. E. White, the Department lost a faithful, diligent and efficient assistant, his associates a valued friend and companion and the community a loyal, patriotic citizen; one to whom all who knew him extend with heartfelt emotion the parting salutation:

“Well done, thou good and faithful servant.”

STATE INSTITUTIONS.

The state institutions for which the services of the Department of Engineering are required, under the law, are as follows:

Educational.

California School for the Deaf and the Blind, Berkeley.
Chico State Normal School.
Fresno State Normal School.
Humboldt State Normal School, Arcata.
Los Angeles State Normal School.
San Diego State Normal School.
San Francisco State Normal School.
San Jose State Normal School.
Santa Barbara State Normal School of Manual Arts and Home Economics.
San Luis Obispo State Polytechnic School.

Benevolent.

Industrial Home for Mechanical Trades for the Adult Blind, Oakland.

State Hospitals.

Agnews, Agnew, Santa Clara County.
Mendocino, Ukiah, Mendocino County.
Napa, Napa, Napa County.
Norwalk, Norwalk, Los Angeles County.
Southern California, Patton, San Bernardino County.
Stockton, Stockton, San Joaquin County.
Sonoma State Home (for feeble-minded children), Eldridge, Sonoma County.
Pacific Colony, School for Feeble-Minded, Sonoma, Sonoma County.

Punitive.

State Prison, Represa, Sacramento County.
State Prison, San Quentin, Marin County.

Reformatory.

Preston School of Industry, Ione, Amador County.
Whittier State School, Whittier, Los Angeles County.
California State School for Girls, Ventura, Ventura County.

Military.

Veterans' Home, Yountville, Napa County.
State Arsenal and Armory, Sacramento.
State Armory, San Francisco.
State Armory, Los Angeles.
State Armory, Stockton.
State Armory, Naval Militia, San Diego.

Miscellaneous.

State Capitol, building and grounds, Sacramento.
Governor's Mansion, Sacramento.
State Printing Office, Sacramento.
State Fair, buildings and grounds, Sacramento.
Sixth District Agricultural Fair, Los Angeles, buildings.
Sutter's Fort, buildings and grounds, Sacramento.
Marshall's Monument, building and grounds, Coloma.
California Redwood Park, buildings and grounds, Santa Cruz County.
Women's Relief Corps, buildings and grounds, San Jose.

Harbor Front, wharves, piers and buildings, San Francisco.
Mission Solano, Sonoma County (restoration).
Old Russian Church, Fort Ross (restoration).
Monterey Custom House and Old Theatre (restoration).
State Fish and Game Commission (hatcheries).
State Mining Bureau, buildings at Taft and Coalinga.
Los Angeles Exposition Building.
State office buildings, Sacramento (authorized, not commenced).
State office buildings, San Francisco (under construction).

Architectural and Engineering Service at State Institutions.

All work of the Department pertaining to state buildings, whether relating to the preparation of plans and specifications, or erection and installation, including mechanical plants of every kind, is executed by the architectural bureau of the Department, and a review of the work accomplished by that bureau will be found in the report of the State Architect following.

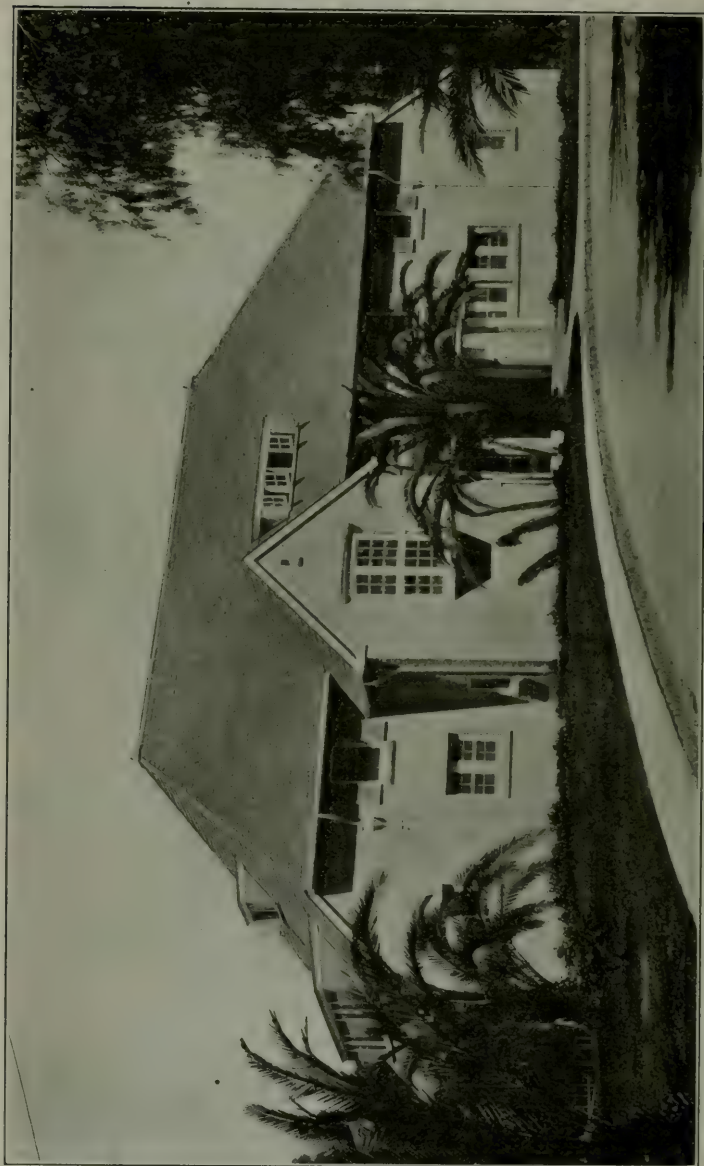


PLATE II. Southern California State Hospital—Nurses' Home.

PART II.

ARCHITECTURE.

REPORT OF THE BUREAU OF ARCHITECTURE.

Covering Operations From October 1, 1918 to November 1, 1920.

By GEORGE B. McDOUGALL, A. I. A., STATE ARCHITECT.

The Bureau of Architecture of the Department of Engineering has charge of all building construction: First, at twenty-three different state institutions, which have a combined population in students, patients and prisoners of about 20,000; second, at seventeen other state institutions or enterprises, making a total of forty different institutions and enterprises.

The State Architect is the Director of the Bureau, which Bureau is divided into the Architectural Division, of which the Assistant State Architect is Director, and the Engineering Division, of which the Chief Engineer is Director.

In the Architectural Division are the following sections: Architectural Designing; Landscape Architecture; Architectural Drafting; Specification Writing, Material Cataloging and Testing, Change Orders; Quantity Surveying, Estimating, Construction, Contract and Day's Labor, Inspection; Blue Printing.

In the Engineering Division are the following sections: Mechanical Engineering, including design and construction of plumbing, heating, ventilating and all other mechanical installations in buildings, boiler plants, pumping plants, swimming pools, sewage disposal systems; Structural Engineering involved in buildings, boiler plants, pumping plants, sewage disposal systems, dams and reservoirs in connection with water supply and irrigation systems for institutions; Hydraulic Engineering connected with water supply and irrigation systems for institutions; Civil Engineering, including surveying and road building; Electrical Engineering, covering light and power for buildings and for water supply and irrigation systems.

During the present biennium the Bureau is handling a total of 129 pieces of construction work in all the above mentioned branches and including the San Francisco State Building and the Sacramento State Buildings; the total cost of these 129 projects will be about \$6,500,000. There will have been expended on the San Francisco State Building at the end of the present biennium, about \$900,000, and while the plans and specifications for the Sacramento State Buildings are ready for bids, probably no actual construction will be done during the present biennium, due to the fact that bonds bearing 4 per cent interest are unsalable. Therefore, the amount of money actually expended under the direction of the Bureau during the present biennium will be about \$2,750,000.



PLATE III. Norwalk State Hospital—Superintendent's Residence.

Of the 129 pieces of work handled, 84 are completed; 29 are under construction; 6 are ready for construction work to start and of the remaining 10, working drawings for 7 are in various stages toward completion, and nothing whatever has been done with 3; these three are being delayed by circumstances over which the Bureau of Architecture has no control.

There is necessarily a considerable amount of office work done in connection with proposed construction at the various institutions that is never carried through and is not taken into account in the above figures. In addition to this, it is necessary for us to comply with requests for counsel and advice from the various institutions, boards and commissions, and in the aggregate, the amount of time given during the biennial period to consultation, making of sketches and general assistance is very considerable.

More than one-third of the time of those employees whose employment is necessarily continuous throughout the biennium, is consumed on necessary matters entirely outside of the 129 pieces of work mentioned.

Of these 129 pieces of work referred to above, omitting from this consideration the San Francisco and Sacramento State Buildings, 19 were of a value less than \$1,000; 74 were between \$1,000 and \$12,500; 9 were between \$12,500 and \$20,000; 15 were between \$20,000 and \$50,000, and 7 were over \$50,000.

The large proportion of work of small total cost as indicated by the figures just given, makes the average percentage of cost for our work higher than would be the case otherwise.

Under the present method of financing the Department, the salaries of fourteen of the continuously employed men in the Bureau of Architecture are provided by statute, and the salaries of the twelve remaining continuous employees are charged pro rata against all the special legislative appropriations on which the Bureau is working.

Since approximately one-third of the time of these twenty-six employees is consumed on matters not connected with these special appropriations, the apparent percentage of cost of our work in connection with them, exceeds the actual percentage.

While the Bureau has always found it necessary to do portions of its construction work by days labor, it has been necessary during the present biennium, on account of extraordinary and abnormal conditions in the labor and material market—the result of the World War—to use this method almost exclusively; the result is that we are saving time and money and are getting better materials and workmanship than would have been obtained by the contract method.

The term, "days labor method," it should be understood, includes the subletting by contract of portions of the work when conditions make this desirable.

We save time under days labor: First, because fewer drawings are required; and second, the omission of advertising for bids and the lettering and approvals of contracts saves about two months time in each case; third, work of construction being under our own control, progress is more nearly continuous than is usual under the contract method.

We save money, partly on account of making fewer drawings and specifications, partly on account of the use of the state's credit in making purchases of materials, partly by keeping expenses for necessary changes at actual cost, and partly in reduced inspection cost, which, under the contract method, is overhead, whereas under days labor the inspector becomes general foreman in charge and is a part of construction cost, being in the same category as other employees on the work; the principal saving under days labor, however, is the elimination of the contractor's profit and overhead; and the elimination of the cost to a contractor for two 50 per cent bonds and for compensation insurance. The fees for these bonds and for compensating insurance amount, on the average, to 4 per cent of the total cost of the work.

We get better materials and workmanship because of the natural tendency on the part of a contractor under the contract method, to make his profit as large as possible.

The cost for all purposes of constructing the 129 pieces of work already mentioned, under the Bureau of Architecture on a days labor basis, is made up of the items listed below.

The percentages given in this list are arrived at from the books of the auditing division, and are based on the operations of the Bureau during the period June, 1919, to June, 1920, during which year comparatively a small amount of work was approved and performed, since only \$1,004,-202.62 was expended on construction work, notwithstanding the high costs of materials and labor due to war conditions; whereas our average yearly pre-war expenditures for the four years, March, 1913, to March, 1917, for construction under low price conditions, was \$1,179,383. A general salary increase made subsequent to June, 1920, the limit of the period on which the following percentage figures are based, will be offset and probably more than offset, by the increased amount of construction to be done, and will be reflected in the cost data of future years:

Nonstatutory salaries covering drafting	4 per cent
Nonstatutory salaries of continuous employees	1.6 per cent
Statutory salaries of continuous employees	3.5 per cent
(The last two mentioned items totaling 5.1 per cent, in addition to covering necessary work affecting the 129 pieces of work being carried on, cover also the one-third of the time of 26 employees who are compensated under these two items, which time is consumed on matters outside of the 129 pieces of work).	
Inspection (covering certain contract work) .....	.3 per cent
Traveling and contingent	1.3 per cent
Auditing cost	1.3 per cent
Total	12.0 per cent

The Schedule of Proper Minimum Charges of the American Institute of Architects, which schedule today governs the practice of all our best architects, makes 6 per cent of the total cost the architect's minimum compensation in any case, and where the work is of small cost, and in connection with the remodeling of existing buildings, 10 per cent and sometimes 15 per cent of the cost is paid. Based upon the figures of cost for the 127 pieces of work being carried on, as already above given, omitting the state buildings at San Francisco and Sacramento, since private architects are employed on these, the average percentage to cover this fee under the Institute's schedule, shows $7\frac{1}{2}$ per cent as the proper minimum charge. The Institute's schedule also provides that the owner, in addition to this percentage payment, shall defray the expense (amounting to about 1 per cent of the total cost) involved in securing special expert service covering mechanical engineering, which includes power plants, heating, ventilating and electrical engineering (all of which items are included in the 12 per cent above mentioned); also the expense of $1\frac{1}{2}$ per cent involved in the continuous service at the building site itself of a clerk of works or superintendent of construction; also expense of 1.3 per cent for traveling and of 1.3 per cent for auditing; all these items are included in the 12 per cent total cost under the Bureau, mentioned above, the days labor method being used. The total of these percentages is 12.6 per cent covering the cost of employing private architects. To these percentages must be added 10 per cent if the architects conduct the work direct without the intervention of a general contractor, and from 16 per cent to 20 per cent instead of this latter 10 per cent if the work is contracted for as a whole under a general contractor.

Thus, under the schedule of the American Institute of Architects, the minimum total cost of carrying on these 127 pieces of construction work, to be added to the actual cost of materials and labor, would have been 22.6 per cent under the days labor method, and between 28.6 per cent and 32.6 per cent under a general contract, whereas under the Bureau, it has been and is being done for 12 per cent, this 12 per cent covering in addition, the time of employees consumed on matters outside of the 127 pieces of work being handled.

In considering these figures just given, it should be borne in mind that the offices of private architects are not organized to purchase materials direct and employ mechanics direct in the handling of days labor work; therefore, the large amount of work now being handled by the bureau in this way—thus eliminating subcontractor's as well as general contractor's profit and overhead—either could not be so handled, or would have to be carried on through the Construction Section of the Architectural Division of the Bureau of Architecture as now organized.

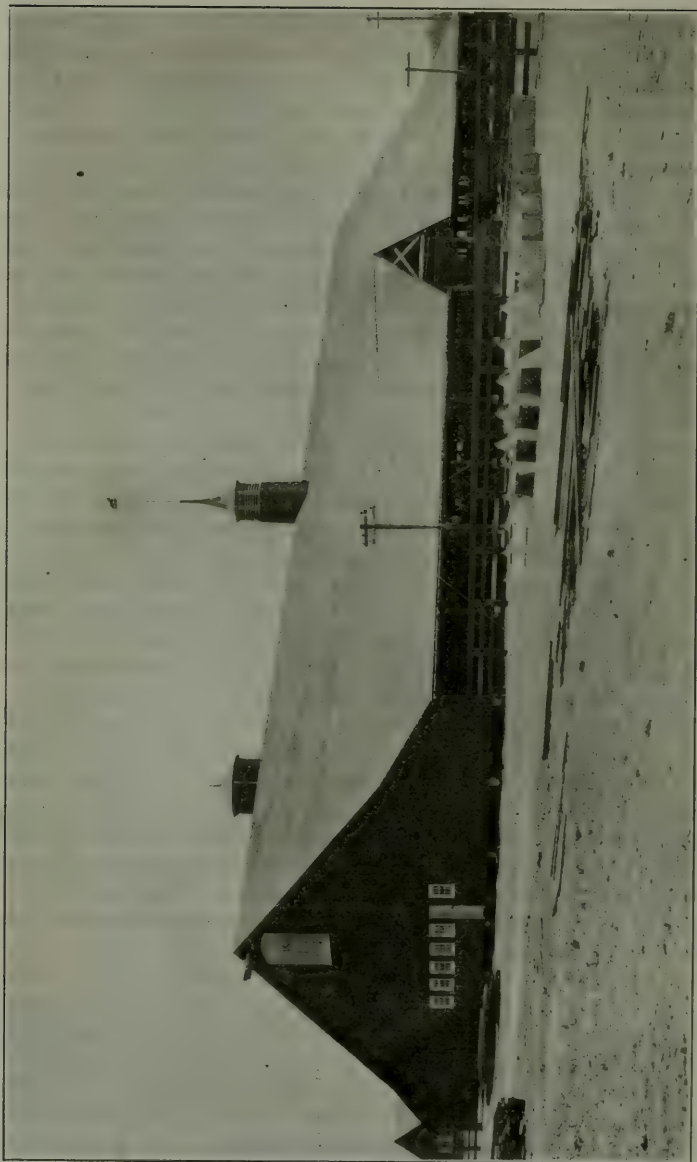


PLATE IV. Norwalk State Hospital—Hay Barn.

The figures above given, indicate that during the present biennium the Bureau is saving from 16 per cent to 20 per cent on the total cost of the work being handled, as compared with the cost under private architects and general contractors, this total saving being in excess of \$400,000.

Following is a list of buildings in connection with which these savings are being made:

San Francisco State Building.
 Cottages for Employees, Agnews State Hospital.
 Miscellaneous Improvements, Mendocino State Hospital.
 Quarters for Employees, Napa State Hospital.
 Two Cottages for Convalescents, Dining Room Building and Officers' Quarters,
 and Administration Building, Norwalk State Hospital.
 Cottage on the Farm, Stockton State Hospital.
 Manual Arts Building, Chico State Normal School.
 Humboldt State Normal School Building.
 Several buildings at the Whittier State School.
 School Cottage and Second Unit of the No Privilege Cottage, California School
 for Girls, Ventura.
 Cottage for Inmates, Sonoma State Home.
 Miscellaneous Improvements, Veterans' Home.
 Group Building, Pacific Colony.

Additional financial saving through the use of the days labor method --above that already referred to--is made at a number of the state institutions where inmate labor is available for construction, for example. The San Quentin and Folsom prisons, the Preston and Whittier schools and six hospitals for the insane. Besides the saving of money, there is also the advantage gained by the inmates themselves from the experience involved in their employment on construction work. This fact is made clear by a report made to the State Engineer by the inspector in charge for the Department at the Whittier State School. This report is as follows:

"In answer to your letter of the eighth instant, we hereby submit the information requested:

1. Number of boys employed during the two-year period, ending October 31, 1920, is 82.
 2. Amount earned by boys during same period is \$2,969.00.
 3. Number of boys employed in construction work on payroll since my employment as Inspector, up to October 31, 1920, is 170.
 4. Total amount paid to same, \$8,226.75.
- This does not include the amount paid to boys who continued to work after becoming of age; adding the amount earned by them would bring the total up to \$11,842.

The boys have worked as mechanics' helpers in all lines of building construction. There is special value to the boys in having this opportunity. In the first place they choose to remain of their own accord, thus earning, in the open market, money desired and are given some of the after life experiences before they are placed entirely upon their own resources. In the next place they earn the money with which to buy transportation, extra clothing, etc., and go home with money on hand. They return to their families, not as dependents but as wage earners, and have funds sufficient to carry them over the job hunting period. Having to meet ordinary workmen's hours and conditions is very valuable. The added measure of self control and self direction, with some of the opportunities to come and go without the usual

school restraint, builds up the qualities necessary for life away from the close supervision to which they have been subjected.

Three of these boys who have continued in the employ of this Department after they were 21 years of age, have earned since their discharge, \$3,615.25. Two of the boys have married; one is the father of a promising young son and he has recently been made boss of the working detail into which some boys from the school are placed. Another of these boys, on returning to the school after being discharged from the service, entered the employ of the school in the garage and receives \$95 a month, room and board. It is of interest to note that his conflict with the law during his teens was always associated with an improper use of other people's automobiles. For the past three years he has made his living by a *proper* use of other people's automobiles. The fact that with money earned at the School he was able to buy a machine for himself has no doubt assisted him to acquire the accepted point of view regarding the meaning of property rights.

Speaking generally, all furniture for cottages and offices is now, and has been for some years past, made in the school shops, the boys engaging actively in its production under the direction of competent instruction."

The state should have the best work in architecture as well as along all other lines. The Bureau of Architecture is securing this kind of work about as follows:

A full appreciation of the building needs of the various state institutions is secured by frequent consultation with the executive heads and boards of management and by frequent visits of the State Architect and his assistants to the institutions.

The designers in charge of the planning and designing of the buildings, from having been in the state's employ for a considerable length of time, have become specially expert as to the building needs of the state institutions and the best methods of meeting them. A number of the important architectural and engineering publications of the United States are subscribed for so that our architectural men and engineers are kept fully abreast of the best and most recent information and developments in design, planning and construction.

An ample force of draftsmen—architectural, structural, mechanical and electrical—is employed, with the result that working drawings, large scale drawings and full size details are thoroughly complete; the specification writer and estimators keep in continuous touch with the market as to all building materials. Since our mechanical and electrical engineers, structural engineers and specification writer, also our cost estimators, work in conjunction with our architectural men—all employees being under the continuous charge of the heads of the several sections—we are especially well situated to secure perfect and complete sets of working drawings with minimum of lost motion.

Field inspectors are kept in constant touch with the office, through the supervision of the General Superintendent. The Estimating Division has developed a system of cost accounting which operates to keep the Bureau continuously informed as to whether actual costs in the field are checking with the office estimate; this reveals at once any lack of economy in the use of materials and labor in the field.

The testing engineer of the State Purchasing Department cares for the analysis and testing of materials entering into the construction of buildings where such analysis and test are necessary.

Section 11 of the engineering law provides that the Board of Control, with the approval of the Governor, may, in cases where the best interests of the state require it, arrange for the selection of architects from outside the Department of Engineering, by public competitions, the State Architect being the architectural advisor of the Board of Control in instituting and conducting such competitions.

The present organization of the Bureau of Architecture of the Department of Engineering and this provision for the holding of competitions, provide the means of efficiently meeting all the exigencies of the state's building requirements.

Statement indicating status of work being handled by the Bureau of Architecture of the State Department of Engineering during the biennium following the Legislature of 1919, is contained in the following tables:

REPORT INDICATING STATUS OF WORK HANDLED BY THE BUREAU OF ARCHITECTURE OF THE STATE DEPARTMENT OF
ENGINEERING SINCE THE LEGISLATURE OF 1919.
November 1, 1920.

Fund	Operation	Appropriation	Cost of this work	Remarks
	<i>Agnes State Hospital.</i>			
Cont. Est.	Repairs to heating system.....	\$5,000 00	\$5,000 00	Completed.
Chap. 402, 1919	Improvement to heating plant.....	2,500 00	1,500 00	Completed.
Chap. 568, 1919	Two cottages for physicians.....	22,000 00	22,000 00	Office work complete. Construction on day labor basis just started.
Cont. est.	Repairs, heating administration building.....	500 00	500 00	Completed.
	<i>Agricultural Park, Sacramento.</i>			
Chap. 572, 1919	Miscellaneous repairs to sheds and barns for 1919 and 1920 fairs.....	15,000 00	13,500 00	Completed.
Chap. 591, 1919	Miscellaneous repairs to sheds and barns for 1919 and 1920 fairs.....	10,000 00	10,000 00	Completed.
Chap. 572, 1919	Enclosing porch of machinery building and strengthening trusses.....	15,000 00	1,500 00	Completed.
	<i>California Polytechnic School, San Luis Obispo.</i>			
Chap. 445, 1919	Repairs, improvements and equipment.....	10,000 00	10,000 00	Completed.
	<i>California School for the Deaf and the Blind, Berkeley</i>			
Chap. 384, 1919	Repairs, improvements and equipment.....	9,300 00	9,300 00	Completed.
	<i>California School for Girls, Ventura.</i>			
Chap. 381, 1919	Additions to farm buildings.....	5,000 00	5,000 00	Completed.
Chap. 569, 1919	Miscellaneous repairs and improvements to grounds.....	5,000 00	5,000 00	Completed.
Chap. 388, 1919	Cottage No. 6.....	90,000 00	40,000 00	Sketches prepared and approved. Completion of office work and construction being held up.
Chap. 581, 1919	Sleeping porch, Lost Privilege Cottage.....	20,000 00	750 00	Completed.
Chap. 584, 1919	2d section, No Privilege unit.....	20,000 00	15,000 00	Office work 50% complete. Construction to start in 30 days.
Support est.	Alterations to hospital building.....	2,400 00	2,400 00	Completed.
Chap. 388, 1919	School building.....	90,000 00	23,000 00	Practically completed.
Support Fund	Completion work buildings and grounds.....	1,100 00	1,100 00	Completed.
Support Fund	Alterations No Privilege Cottage.....	1,769 00	1,769 00	Completed.
Cont. Fund	Alterations No Privilege Cottage and commissary building.....	630 73	630 73	Completed.
	<i>Chico State Normal School.</i>			
Chap. 550, 1919	Trade school unit.....	32,000 00	32,000 00	Office work complete. Under construction; about 80% complete.
Chap. 553, 1919	Repairs to buildings.....	6,000 00	6,000 00	Completed.
Chap. 557, 1919	Pump house.....	10,000 00	10,000 00	Completed.

Chap. 76, 1917	<i>Folsom State Prison.</i>	10,000 00	10,000 00	Office work complete; being built by institution labor; about 70% complete.
Chap. 356, 1919	Prison school building-----	4,000 00	4,000 00	Office work partially done; construction to start soon.
Chap. 422, 1919	Electrical construction and equipment-----	4,000 00	2,500 00	Equipment purchased by institution.
Chap. 467, 1919	Machine and blacksmith shop-----	10,000 00	6,500 00	Being done by institution as needed.
Chap. 467, 1919	Repairs and improvements-----	10,000 00	3,500 00	Completed.
Chap. 467, 1919	Guards' cottage-----	5,700 00	5,700 00	Completed.
Chap. 436, 1919	<i>Fresno State Normal School.</i>	230,000 00	230,000 00	Office work complete; construction work 50% complete.
Chap. 743, 1917	Repairs and improvements-----	650 00	650 00	Completed.
Chap. 743, 1917	Main building-----	36,100 00	36,100 00	Surveys and estimates completed.
Chap. 408, 1919	<i>Humboldt State Normal School, Arcata.</i>	4,500 00	4,500 00	Completed.
Chap. 408, 1919	Painting of buildings-----	5,000 00	5,000 00	Completed.
Chap. 165, 1919	<i>Industrial Farm for Women.</i>	5,000 00	5,000 00	Completed.
Chap. 165, 1919	Alterations to existing buildings, service lines, sewage disposal, water supply-----	5,700 00	5,700 00	Completed.
Chap. 446, 1919	<i>Industrial Home for the Adult Blind, Oakland.</i>	1,000 00	1,000 00	Completed.
Chap. 446, 1919	Repairs, improvements and equipment-----	2,500 00	2,500 00	Completed.
Chap. 403, 1919	<i>Mendocino State Hospital.</i>	50,000 00	50,000 00	Office work complete; construction by day labor being started.
Chap. 403, 1919	Cottage for tubercular patients-----	1,400 00	1,400 00	Work being done by institution; about 50% complete.
Chap. 404, 1919	Improvements, steam distribution system-----	2,500 00	2,500 00	Nothing being done; funds inadequate.
Chap. 443, 1919	Spelters for women patients-----	850 00	700 00	Completed.
Chap. 444, 1919	Tank tower-----	600 00	600 00	Completed.
Cont. est.	<i>Napa State Hospital.</i>			
Chap. 397, 1919	Improvement to heating plant-----			
Chap. 565, 1919	Quarters for employees-----			
Institu'n Fund	Removal of cottage for employees from Lak. Marie-----			
Chap. 242, 1917	Pathological laboratory-----			
Cont. est.	Boring well-----			
Cont. est.	Connecting main power line-----			
Cont. est.	Electrical installation-----			

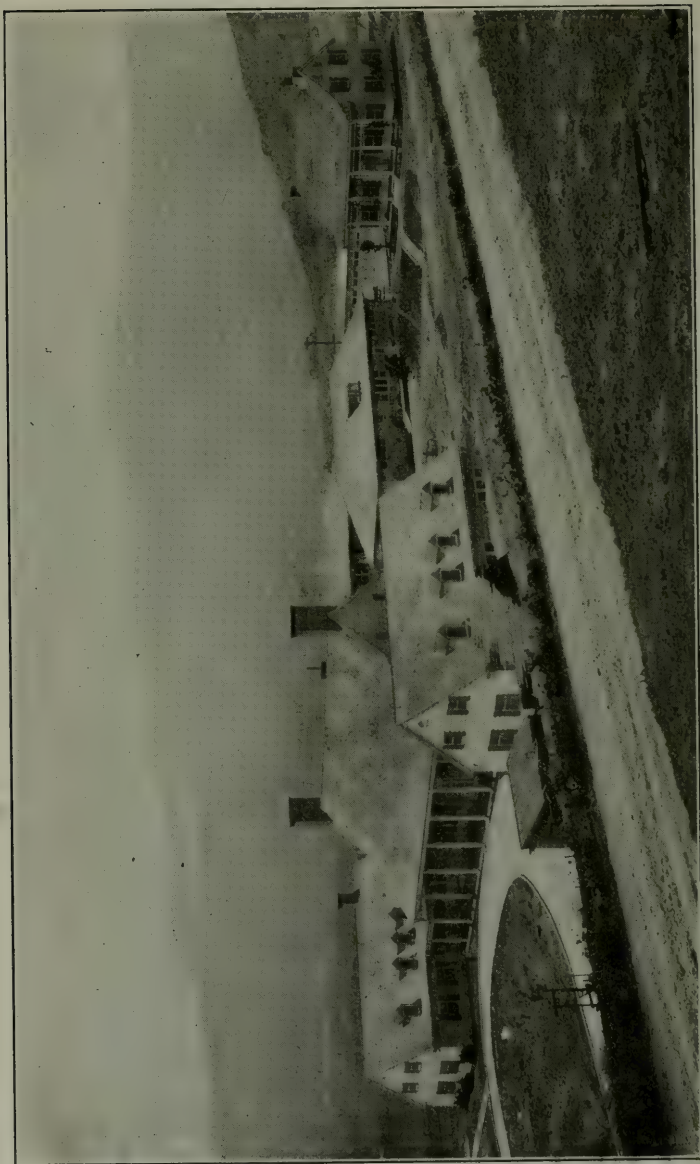


PLATE V. California School for Girls—Center Group of Buildings.



PLATE VI. Pacific Colony—Buildings Under Construction.

REPORT INDICATING STATUS OF WORK HANDLED BY THE BUREAU OF ARCHITECTURE OF THE STATE DEPARTMENT OF
ENGINEERING SINCE THE LEGISLATURE OF 1919--Continued.
November 1, 1920.

Fund	Operation	Appropriation	Cost of this work	Remarks
	<i>Norwalk State Hospital.</i>			
Chap. 585, 1919	Steel water tower and tank-----	20,000 00	13,500 00	Completed.
Chap. 586, 1919	Improvements on the farm-----	5,000 00	5,000 00	Completed.
Chap. 344, 1917	Farm buildings-----	45,600 00	45,600 00	Completed.
Chap. 345, 1917	Administration building-----	50,000 00	40,000 00	Sketches completed; working drawings to be started at once.
Chap. 587, 1919	Two cottages for patients-----	150,000 00	140,000 00	Bids for construction to be opened Nov. 8, 1920.
Chap. 588, 1919	Building for officers quarters-----	45,000 00	45,000 00	Being constructed on day labor basis; about 15% complete.
Chap. 585, 1919	Water service lines-----	20,000 00	6,500 00	Office work under way; no materials ordered.
Cont. est.	Completion, superintendent's residence-----	1,150 00	1,150 00	Completed.
Chap. 776, 1917	} Group building-----	115,000 00	70,000 00	Under construction on day labor basis; about 70% complete.
Chap. 562, 1919				
Chap. 562, 1919	Trades building-----	100,000 00	5,500 00	Completed.
Chap. 562, 1919	Roads-----	100,000 00	7,500 00	Partially completed.
Chap. 562, 1919	} Pole line-----	100,000 00	6,500 00	Completed.
Cont. est.				
Chap. 562, 1919	Service lines, water, sewer, gas-----	100,000 00	12,000 00	Partially completed.
Chap. 562, 1919	Horse barn-----	100,000 00	1,000 00	Office work completed; construction being held up; awaiting approval of trustees.
	<i>Preston School of Industry, Ione.</i>			
Chap. 400, 1919	Horse barn-----	57,000 00	3,400 00	Completed.
Chap. 400, 1919	Alterations to kitchens-----	37,000 00	2,500 00	Office work complete; construction being done by institution.
Chap. 400, 1919	Repairs to electric work-----	57,000 00	2,500 00	Materials being ordered.
Chap. 400, 1919	Improvements to heating plant-----	57,000 00	1,300 00	Completed.
Chap. 400, 1919	Alterations to band cottage-----	57,000 00	10,000 00	Further construction work held up pending decision on use of building.
Chap. 400, 1919	Septic tank-----	57,000 00	14,000 00	Office work completed; construction to proceed at once.
Chap. 400, 1919	Improvements to water supply-----	57,000 00	16,650 00	Survey now under way; some work completed.
Chap. 400, 1919	Miscellaneous repairs and improvements-----	57,000 00	5,000 00	Being done by institution.

Chap. 235, 1913 Chap. 619, 1919	<i>Sacramento State Buildings.</i> Capitol extension buildings.....	3,300,000 00	3,300,000 00	Work being held up pending sale of bonds.
Chap. 411, 1919 Chap. 461, 1919	<i>San Diego State Normal School.</i> Repairs, improvements and equipment..... Improvements to grounds.....	3,000 00 1,500 00	3,000 00 1,500 00	Completed. Completed.
Chap. 541, 1913 Chap. 618, 1919	<i>San Francisco State Office Building.</i> Construction of building.....	1,350,000 00	1,350,000 00	Excavating and foundation work completed; steel frame being erected; being built by sub-contract method.
Chap. 395, 1919	<i>San Francisco State Normal School.</i> Repairs to buildings and equipment.....	5,000 00	5,000 00	Being done by institution.
Chap. 238, 1917 Chap. 391, 1919 Chap. 476, 1919 Institu'n Fund	<i>San Jose State Normal School.</i> Assembly hall..... Improvements to heating plant..... Repairs, improvements and equipment..... Repairs to telephone system.....	80,000 00 710 00 9,373 42 600 00	70,000 00 710 00 9,373 42 600 00	Completed. Completed. Completed. Completed.
Chap. 401, 1919 Chap. 453, 1919 Chap. 454, 1919	<i>San Quentin State Prison.</i> Completion of electrical installation..... Repairs and improvements..... Purchase and installation of machinery and equipment.....	6,650 00 15,000 00 40,000 00	6,650 00 15,000 00 40,000 00	Practically completed. Being done by institution as needed. Being done by institution.
Chap. 451, 1919 Energy. Fund Chap. 451, 1919	<i>Santa Barbara State Normal School.</i> Repairs, improvements and equipment..... Repairs to gymnasium roof..... Paving roads.....	6,500 00 767 00 6,500 00	4,600 00 767 00 1,900 00	Completed. Completed. Completed.
Chap. 353, 1917	<i>Sonoma State Home, Eldridge.</i> Reconstruction of Madonna Hall for commissary.....	5,600 00	5,000 00	Office work complete; now under construction; 30% complete.
Chap. 389, 1919 Chap. 482, 1919 Chap. 624, 1919 Institu'n Fund Cont. est.	Repairs to sewers and surface drains..... Raising dams and developing water supply..... Cottage for inmates..... Improvement to telephone system..... Garage.....	23,000 00 90,000 00 28,000 00 700 00 3,400 00	23,000 00 10,000 00 24,000 00 700 00 3,400 00	Practically completed. Construction work has just been started. Completed. Material on order but not installed. Completed.
Chap. 440, 1919	<i>Southern California State Hospital.</i> Improvement to heating plant.....	5,850 00	4,550 00	Completed.

REPORT INDICATING STATUS OF WORK HANDLED BY THE BUREAU OF ARCHITECTURE OF THE STATE DEPARTMENT OF
ENGINEERING SINCE THE LEGISLATURE OF 1919—Continued.
November 1, 1920.

Fund	Operation	Appropriation	Cost of this work	Remarks
	<i>Stockton State Hospital.</i>			
Chap. 330, 1917	Cottage for disturbed patients.....	45,000 00	45,000 00	Completed.
Chap. 272, 1917	Cottage for tubercular patients.....	10,000 00	10,000 00	Completed.
Chap. 394, 1919	Completion and equipment of the tubercular hospital building.	12,500 00	12,200 00	Completed.
Chap. 388, 1919	Sewage disposal on the farm.....	15,000 00		Under consideration in office.
Chap. 390, 1919	Repairs and alterations.....	12,000 00	12,000 00	Completed.
Chap. 437, 1919	Improvements to heating plant.....	2,850 00	1,800 00	Completed.
Chap. 401, 1919	Cottage on the farm.....	50,000 00	50,000 00	Office work complete; construction 60% complete.
Cont. est.	Painting tower tank.....	700 00	600 00	Completed.
Cont. est.	Repairs to water storage tanks.....	350 00	350 00	Completed.
Cont. est.	Main sewer.....	10,000 00	9,600 00	Completed.
	<i>Veterans' Home, Yountville.</i>			
Chap. 442, 1919	Repairs, improvements and equipment.....	63,500 00	10,900 00	Being done by institution as needed.
Chap. 442, 1919	Repairs, improvements and equipment.....	63,500 00	40,100 00	Practically completed.
Chap. 442, 1919	Septic tank.....	63,500 00	12,500 00	Completed.
Chap. 483, 1917	Boilers.....	15,000 00	9,000 00	Materials purchased.
	<i>Whittier State School.</i>			
Chap. 336, 1917	New Shop Building and Power House.....	82,500 00	35,000 00	Completed.
Chap. 336, 1917	Laundry and tailor shop.....	25,000 00		Completed.
Chap. 337, 1917	Power house equipment.....	82,500 00	15,000 00	Completed.
Chap. 335, 1917	Superintendent's residence.....	45,000 00	8,000 00	Completed.
Chap. 629, 1919	Shoe shop and print shop.....	25,000 00	18,000 00	Practically completed.
Chap. 629, 1919	Intercommunicating telephone system.....	64,000 00	20,000 00	Practically completed.
Cont. est.	New well.....	64,000 00	4,500 00	Materials ordered only.
Chap. 629, 1919	Service lines, miscellaneous repairs and improvements.....	64,000 00	6,500 00	Completed.
Chap. 590, 1919	Ground lighting system.....	64,000 00	11,250 00	Partially completed.
Cont. est.	Repairs to junior department.....	23,500 00	2,700 00	Materials ordered only.
Cont. est.	Alterations to dining building.....		5,000 00	Completed.
Cont. est.	Building No. 23 (school).....		3,000 00	Under construction; 25% completed.
Cont. est.	Garage for employees' automobiles.....		37,000 00	Office work practically completed.
Chap. 629, 1919	New electric service feeds.....	64,000 00	1,250 00	Completed.
			3,500 00	Partially completed.

Chap. 622, 1919	Change to Rincon ditch-----	64,000 00	1,500 00	Completed.
Chap. 336, 1917	Pole line-----	650 00	415 00	Completed.
Support Fund	Storage tank in kitchen-----	500 00	500 00	Completed.
Chap. 466, 1919	Women's Relief Corps Home. Repairs, improvements and equipment-----	1,200 00	1,200 00	Completed.
Chap. 762, 1917	Miscellaneous. State printing plant-----	100,000 00	100,000 00	Nothing being done; no site selected.
Chap. 387, 1919	Enclosing Marshall's blacksmith shop, Kelsey, Cal-----	1,500 00	1,500 00	Completed.
Fish and Game Preserv. Fnd.	Tahoe Fish Hatchery, Lake Tahoe-----	27,762 00	27,762 00	Completed.
Chap. 645, 1919	Alterations in Capitol-----	1,350 00	1,154 00	Completed.
Chap. 334, 1917	French door, Exposition Building, Los Angeles-----	275 00	205 00	Completed.
Emergy. Fund	Alterations to Governor's mansion-----	950 00	950 00	Completed.
Chap. 438, 1919	Repairs, Purchasing Department rooms-----	880 00	880 00	Completed.
Chap. 458, 1919	Alterations to Frommer building-----	5,800 00	5,800 00	Completed.
National Guard Support Fnd.	Alterations to San Francisco Armory-----	7,500 00	7,500 00	Completed.



PLATE VII. Whittier State School—Powerhouse.

PART III.

HYDROECONOMICS.

Every body of water has its uses, and often one body may have several uses, all contributing to the welfare of man. Broad arms of the sea, stretching inland, offer easy highways for cheap communication and transportation for the communities along their shores. Broad rivers afford like facilities for commerce, and also furnish water for irrigation of the lands along their banks to produce that commerce. Tributary streams contribute power for lighting the streets and homes of communities, created by the benign influences of the others, as well as operating the myriad wheels of industry. And all unite, in the mad moods of nature, to send destruction and ruin upon the works of their beneficence.

Each body or stream has problems of its own to be solved that its forces may be directed to beneficial use, some akin and some dissimilar in the methods of their solution.

RIVER PROBLEMS.

SACRAMENTO RIVER.

Floods.

For unknown ages the Sacramento Valley has been subject to periodical inundations from its rivers overflowing their banks in flood.

The Sacramento River in flood pours 200,000 to 250,000 second feet of water into the valley at Iron Canyon. The capacity of the natural channel to carry water below this point for some miles is ample, but after passing Chico its capacity is rapidly reduced, so that in the vicinity of Colusa it is less than 100,000 second feet and below that point its capacity is only 23,000 second feet, or about ten per cent of the flood flow measured at Iron Canyon.

Stony Creek enters the Sacramento River below Chico. Feather River, carrying its own waters together with those of Yuba and Bear rivers, joins the Sacramento at Vernon twenty miles above the city of Sacramento.

The combined flow of all of these streams, each measured where it enters the valley has been found to be more than 580,000 second feet. Many smaller unmeasured streams join the rivers below the points of measurement so it is believed safe to assume that the aggregate of run-off reaching the valley above Vernon was not less than 650,000 second feet.

The capacity of the Sacramento River channel between Vernon and Sacramento City is 62,000 to as little as 36,000 second feet in places.

At Sacramento the flood is reinforced by 100,000 to 125,000 second feet from the American River, entering at the northern limits of Sacramento City. These quantities bring the aggregate flow to 750,000 to 775,000 second feet.

The carrying capacity of the Sacramento channel below the American, augmented as it is by high levees, is recorded as being 75,000 second feet.

Accessions from Cache Creek, Putah Creek and other unmeasured streams, together with the run-off from the floor of the valley, has increased the total volume reaching the throat of the valley near Rio Vista well nigh to 850,000 second feet in extreme flood.

The capacity of the channel below Rio Vista is placed at 300,000 second feet to Three-Mile Slough and 200,000 second feet thence to Suisun Bay.

Estimates based upon known high water marks made by the great flood of 1862 indicate that approximately one million second feet flowed into the valley in that memorable flood.

A comparison of the flood volume of the principal large rivers of the United States appears as follows:

Stream	Second Feet Maximum Discharge
Mississippi, above the Missouri-----	546,000
Missouri -----	366,000
Ohio -----	1,233,000
Mississippi, at Vicksburg -----	1,777,000
Columbia -----	1,390,000
Sacramento -----	850,000 to 1,000,000

These comparative figures make the Sacramento the fourth largest stream in volume of flood flow in the United States.

Comparing the above figures of measured flow with the stated capacity of the channel it is conclusive that 90 per cent of the flood waters must find other routes than the river channel in their course to the sea.

All along their course the rivers in every flood were continually spilling over their banks or making breaches therein. The escaping waters accumulated in the basins at each side whence they eventually found their way back to the parent channel and into the Bay.

Reclamation of Lands.

In flooding the basins no less than a million acres of the most fertile land in the valley was inundated.

For generations men had endeavored to reclaim portions of this land to agricultural purposes by building levees around individual tracts, but in the absence of concerted action based on a comprehensive plan involving all elements, their efforts were largely abortive and each recurrence of floods brought destruction and devastation.

Navigation.

Ever since civilized man established himself in the interior of California the Sacramento River has been an important highway.

Its navigability had influence in locating General Sutter's settlement at the present site of the state capital.

Before the advent of the railroads all commerce with the populous mining regions of the mountains encircling the valley was carried on by steamboats and sailing vessels from San Francisco to Sacramento and points above. Steamers regularly plied to Red Bluff on the Sacramento, and even to Redding, on rare occasions.

Marysville was a regular river port on the Feather River, and sometimes steamers even went as far as Oroville.

In low water season only shallow-draft vessels could navigate, but for a large part of the year most any of the vessels of 50 years ago could pass well above Sacramento.

Debris Influx.

Unrestrained hydraulic mining in the mountains drained by the tributaries of the Sacramento River washed immeasurable quantities of debris into the navigable channels traversing the valley below. This material, gravel, sand, and silt, lodging in the beds of the streams, seriously interfered with navigation. Steamers were no longer able to reach Red Bluff or Marysville in low water and found difficulty in crossing sand bars in the river below Sacramento city.

REMEDIAL MEASURES.

The injury to navigation became so pronounced that the federal government was forced to take action.

The Caminetti Act was passed in 1893, forbidding all hydraulic mining where the debris could not be prevented from entering the navigable streams.

The act created the California Debris Commission to enforce its provisions against mining and directed it to devise means for arresting the flow of debris down the rivers, to prescribe measures to ameliorate conditions already existing.

Debris Control in Yuba River.

The Debris Commission formulated a plan for holding back the debris in the Yuba River Canyon by means of barriers or dams, and to limit the erosion of accumulated masses along the river in the valley by training walls, which would confine the stream to narrow limits.

Congress and the state legislature each appropriated \$400,000 to carry out the plans, and the commission has been steadily engaged in the work since.

The first barriers constructed were destroyed by the flood of 1907, but under altered designs a barrier has been constructed across the mouth of the canyon which has intercepted and stored many millions of cubic yards of debris.

In connection with the barrier an artificial cut was made through Daguerre Point and the river deflected through it. A weir was constructed in the cut, which greatly increased the storage capacity of the debris basin, and it is contemplated to increase the height of the weir, thus still further enlarging the storage behind it.

Training walls were built from the outlet of Daguerre Point cut, extending down both sides of the river for several miles.

These works have produced a marked decrease in the movement of material into the Feather River and thence into the Sacramento.

Debris Commission's Report.

Pursuing its investigations and studies of other streams the Commission found that any effort to improve navigable conditions could only be made effective by also controlling the floods which periodically visited the valley.

In 1911 the Commission presented its report, which was published as House Document No. 81, Sixty-second Congress, first session, and which became the basis for all work since conducted by federal and state authorities or private interests.

The report pointed out that effective control of floods would make possible the permanent reclamation of all lands hitherto subject to flooding, and proposed a comprehensive project involving flood control, improvement of navigation and reclamation of overflow lands.

It was proposed that the costs of the work should be borne proportionately by all interests—a portion by the federal government in the interests of navigation; a part by the state because of the benefits to the public through immunity from floods, and the remainder by the interests whose lands were made capable of permanent reclamation.

The cost of the project was estimated at \$33,800,000.

The state legislature promptly adopted the project in December, 1911, and appropriated \$400,000 as its first installment to start the work.

State Reclamation Board.

The State Reclamation Board was created to administer the state's part of the enterprise in cooperation with the Debris Commission.

The plan as submitted was briefly as follows:

(a) To construct strong levees on each bank of the river so as to make the channel carry as much water as possible with safety.

(b) To construct weirs at selected points through which to discharge excess waters under control.

(c) To construct artificial channels through the basins of ample size to convey the excess waters turned into them through the weirs. These by-passes to return their waters to the main river about 15 miles above the mouth of the latter at Suisun Bay.

(d) To enlarge the lower 15 miles of the river channel so it will safely carry the united waters of the river and the by-passes.

The Act of the Legislature creating the Reclamation Board directed the Department of Engineering to work out the details and prepare complete plans for carrying out the objects of the report, and provided funds therefor.

It was also provided that any work executed by private interests in reclaiming land must be done in accordance with the regulations of the Reclamation Board.

Details of Plan.

The project as worked out in detail by the Department from the scheme submitted in the Debris Commission's report, toward which since its adoption, all construction of flood control and reclamation work, by whatever agency conducted, has been directed, may be divided into twelve items described as follows:

(1) A relief weir in the east bank of the Sacramento River at Moulton's Ranch 11 miles above Colusa to allow all but 65,000 second feet of water to escape from the river.

(2) An artificial channel between levees to carry the escaping flood waters into and down Butte Basin to Sutter Basin by-pass.

(3) Closing of Butte Slough and remodeling of Tisdale weir 26 miles below Colusa, in the east bank of the river, and an artificial channel between levees to discharge into the Butte Basin by-pass.

(4) An artificial channel between levees from the Butte Basin by-pass south-easterly along the eastern edge of Sutter Basin to a confluence with Feather River about three miles below Nicolaus.

(5) Strong levees set well back along both banks of Feather River to confine all flood waters within one channel, the levees connecting with similar levees along the Sacramento River.

(6) A relief known as the Fremont weir in the right bank of Sacramento River opposite the mouth of the Feather River of sufficient capacity to pass out all but 50,000 second feet of water.

(7) An artificial channel named Yolo by-pass between levees, to convey the escaping water to the trough of the Yolo Basin and down that basin through Cache Slough to the Sacramento River above Rio Vista.

(8) A cut through the ridge near Knight's Landing to allow water in Colusa Basin east of the Sacramento River, accumulated from drainage and from foothill run-off, to escape into the Yolo by-pass.

(9) Levees along both banks of the Sacramento River from the mouth of the Feather River and Fremont weir creating a channel sufficiently large to safely carry 50,000 second feet to the mouth of American River, and 100,000 second feet below that point.

(10) A relief known as Brytes weir, or Sacramento weir, in right (west) bank of the Sacramento River four miles above Sacramento City, connecting by an arti-

ficial channel with Yolo by-pass designed to pass out all of the water passing below Fremont weir and that contributed by the American River excepting the 100,000 second feet which the Sacramento River is designed to carry.

(11) Widening, deepening and straightening the Sacramento River from the mouth of Cache Slough to Suisun Bay (15 miles) to a capacity to carry all of the waters accumulated from the entire basin of the Sacramento.

In connection with this last feature it is intended to close Three-Mile Slough between Brannan and Sherman Islands which runs from Sacramento to San Joaquin River.

(12) Straightening the channel of the Sacramento River between Fremont weir and Colusa by cutoffs across Race Track, Ministerial, Collins Eddy Bends and from Wild Irishman to McKinney's Bend, effecting a shortening of 6.43 miles in length of channel.

Progress in Construction.

The adoption of the plan for flood control, promising a means of permanent protection of overflow lands, stimulated reclamation work, and many large enterprises were inaugurated.

Construction of levees and by-passes has progressed very rapidly, though in some cases delayed by litigation, which happily has ceased.

When the program was adopted by the legislature an appropriation of \$400,000 was made for initial work, which has been followed up by subsequent appropriations totalling \$680,000 all of which has been met by like appropriations by Congress.

The project plan contemplated enlarging the carrying capacity of the mouth of the river by deepening, widening and straightening the channel from the mouth of Cache Slough to Suisun Bay, a distance of 15 miles.

Out of the first funds provided by joint action of Congress and the legislature, work was begun in 1913 by a hired dredge, and two large suction dredges, the "Sacramento" and the "San Joaquin", were built for the work.

The two government dredges have been engaged in the work in the lower river continuously since they were placed in commission in 1914, excepting when temporarily withdrawn for emergency work elsewhere, and during the war for work directly connected with military operations.

In addition to the government dredges others have been hired from time to time to expedite the enlarging process.

The work is in direct charge of the Debris Commission and according to the last published report for the fiscal year ending June 30, 1919, the total excavation by the government dredges and hired dredges had been as follows:

1913 to 1917 inclusive	30,197,590 cubic yards
1918	5,773,600 cubic yards
1919	5,897,000 cubic yards
Total	41,868,190 cubic yards

This constitutes about 28 per cent of the amount estimated as necessary to be excavated in this unit of the great project proposed in the aforementioned report.

Before work commenced it was estimated that the capacity of the channel of the river below Three-Mile Slough was 200,000 second feet. It is estimated that the work above stated has increased the channel capacity to 338,000 second feet.

Government work with cooperative funds on the up-river units of the project, executed since the last report consisted of dredging two of the four cutoffs to be made between the mouth of Feather River and Colusa. Hired dredges excavated 874,817 cubic yards in making the Collins Eddy cutoff.

The cutoff from Wild Irishman Bend to Kinney's Bend, about 4,000 feet long, was completed in April, 1919. It eliminates Woods Bend and Gray's Bend and shortens the distance about three miles. Hired dredges excavated 500,000 cubic yards in making this cutoff.

Irrigation Problems.

There are about *2,500,000 acres of irrigable land in the Valley, most of which must depend upon the Sacramento River and its tributaries for irrigation water. While some lands are able to produce fairly well without irrigation, others, even those reclaimed from swamps, must have water to make them remunerative, and all require irrigation in greater or less degree to bring them to full productiveness.

If the entire valley were developed, perhaps 70 per cent, or one and three-quarter million acres would be brought under irrigation.

Requirements of Irrigation.

Three acre-feet of water to each acre of land is approximately the quantity required during the year. The proportion of the total amount which should be applied each month is not well determined.

The average of several experiments made upon varied crops in the vicinity of Orland† indicates that most of the water is used in the summer months. The depths applied and their percentage of annual use appear as follows:

June -----	0.51 feet—17 per cent
July -----	0.72 feet—24 per cent
August -----	0.51 feet—17 per cent
September -----	0.54 feet—18 per cent
Total -----	2.28 feet—76 per cent

These percentages are not claimed to be absolute, but they are sufficiently accurate for the purpose of illustration.

*Report of Conservation Commission, 1912.

†Irrigation in the Sacramento Valley, Samuel Fortier, 1909.

Assuming that 1,750,000 acres are to be irrigated on the above basis, then the requirements will be as follows:

In June	892,500 acre-feet
In July	1,260,000 acre-feet
In August	892,500 acre-feet
In September	945,000 acre-feet

Should a larger area be developed, the requirements will be correspondingly greater.

Insufficiency of Summer Flow.

A continuous record of the daily discharge of all the principal streams flowing into the valley has been kept by the United States Geological Survey in cooperation with the Department of Engineering. Only the Sacramento River and its major tributaries reach the valley in the summer.

That record extending from 1905 to the present date, a period of sixteen years, shows that excepting on two occasions the combined flow of all of the streams in June exceeded the quantity stated above as being required for irrigation in that month.

But the record also shows that the discharge in July reached the requirements only once, and August and September never furnished the quota required for those months.

Taking the three years just passed, which has been the most critical period for the water user known since records have been kept, it is found that the average aggregate discharge into the valley in the summer months, compared with the requirements of irrigation as above set forth, would have been as follows:

	Requirements	Average discharge, 1918-19-20
July	1,260,000 acre-feet	395,075 acre-feet; 31 per cent
August	892,500 acre-feet	350,380 acre-feet; 39 per cent
September	945,000 acre-feet	361,770 acre-feet; 38 per cent

A table of summer flow and the accompanying diagram herein presented portray the situation more vividly than words can do, and is commended for careful study.

In considering the figures presented it should be remembered that the low water flow recorded is partly made up of water stored in reservoirs and released by power companies in operating electric generating plants.

It should also be borne in mind that already large tracts of land near the mouth of the river which are irrigated by pumping from the stream have suffered because the supply was not sufficient to keep back the sea water, and unless other means shall be adopted to supply their needs a considerable portion of the inadequate summer flow must always be per-

mitted to flow down and waste in the sea in order to keep back the salt water of the Bay.

It is not known how much water in excess of the irrigation needs it would be required to waste in order to keep the lower river supplied with fresh water, but it would probably be not less than a half million acre-feet in the season. That quantity is approximately one-half of all the water entering the valley in the summer just passed, and nearly one-third of the average summer flow during all the seventeen years since a record has been kept.

A table of the annual flow of the Sacramento River system since 1903-4 is presented elsewhere herein. For the purpose of more clearly showing the trend of the dry cycles the table is divided into three parts, and attention is invited to the marked decline of the normal flow from one group of years to the next.

It will be observed that the mean annual flow of the system from 1903-4 to 1910-11 was, in round numbers, $27\frac{2}{3}$ million acre-feet, in the next group 1912-1916 it had fallen to $21\frac{2}{3}$ million acre-feet and in the last group 1917-20 $13\frac{1}{4}$ million acre-feet. The mean annual discharge for the entire period, 17 years, was $22\frac{1}{2}$ million acre-feet.

However it is not the mean annual flow that concerns the hydraulician, but the winter floods and the low summer discharge which present problems for solution.

The problem of taking care of floods is worked out and the construction of the works to accomplish it is well along.

The cycle of extremely dry years may be completed, and another of wet years commencing, but human prescience cannot tell but next year and others to follow may be as dry. But whatever may be in the immediate future it is certain that other series of dry years will some time return.

Moreover the table of summer flow shows that never, in all the time for which records are available has the summer flow equaled the required quantity, and for the three extremely dry years the flow was only 36 per cent of the quantity required.

The minimum monthly flow reaching the valley during the years 1903 to 1918 was 300,648 acre-feet.

It is plainly evident that the natural flow of the Sacramento River with its tributaries will furnish scarcely 32 per cent of the quantity of water required to irrigate the whole valley up to the requirements of general practice.

Supplemental Sources.

A considerable area is being irrigated successfully from underground sources. The quantity thus obtained is not known. An irrigation

census of the State is now being made but at the date of this writing the figures are not available.

No doubt the area will be somewhat extended, but experience elsewhere of the constant depletion of underground waters as the pumping increases, holds out little hope that the ultimate total development from that source will amount to any considerable portion of the total requirements.

Storage of water in the mountains would then seem to be the only way in which the valley can ever be brought to complete fruitfulness.

There are some reservoirs already constructed for power purposes and a few small ones for irrigation. It is known that several sites exist which may be made available for reservoirs.

The known sites including those utilized aggregate about 6,000,000 acre-feet of storage capacity.

There are other sites which appear to be suitable for reservoirs, but no surveys have been made to determine their capacity nor have examinations been made to ascertain suitable location for dams.

Through the cooperation of this Department, the Reclamation Service a few years ago made surveys of several possible sites in the head waters of the Pit River. In the course of this survey a site which had not been hitherto considered was discovered to have a storage capacity of about 750,000 acre-feet. To utilize it for irrigation it would be necessary to store all of the winter flow of the stream (a tributary of the Pit).

The State has since granted the winter flow to a power company which may forever put that winter water out of availability as a summer supply.

It is believed that other opportunities of the same kind exist for conserving and extending the usefulness of waste winter water, but unless the State changes its policy, they will be quickly acquired by private interests and then can only be recovered to public use at enormous expense.

The Department of Engineering eagerly avails itself of every opportunity to inspect any promising site but has not had funds with which to make surveys.

There are known to be some sites available for storage in localities where there is not sufficient runoff, and where the supply must be brought wholly or in part from neighboring streams. In some cases excellent sites can be used only by pumping the water from a lower source.

All of these expedients will some day be utilized, and it is highly desirable that the extent of storage and approximate cost should be ascertained as soon as possible.

CONFLICTING INTERESTS.

Opposing Irrigation Interests.

This department has persistently uttered warnings that the conditions above described would inevitably lead to conflict. The last five or six years have been subnormal in precipitation and stream flow.

The growth of the rice-growing industry from a few acres experimentally planted in 1912 and 1913 to about 220,000 acres in 1920, is phenomenal. The irrigation of rice requires a greater quantity of water than almost any other crop, the application varying from about 5 to as much as 15 acre-feet.

The islands about the mouth of the river contain some of the most fertile lands in the state, and by the use of the water pumped from the river and its branch channels encircling the islands, have been brought to a state of productiveness not surpassed anywhere.

Formerly the flow of the stream has been great enough to supply their wants without arousing apprehension in the minds of the island irrigators as to the sufficiency and permanency of their water supply.

In 1914 a plan for a municipal supply for the city of Sacramento was formulated wherein the minimum flow past the city was placed at 6,000 second-feet.

The untoward increase of diversions for irrigation in the valley above Sacramento so depleted the flow in 1919 and 1920 that measurements made near the city showed that only 865 second-feet were flowing by, and that was largely seepage and return drainage from the irrigated fields. The concentration of impurities and minerals from the fields has greatly complicated the problem of making it potable for domestic use. The reduced volume of water flowing down the river to the bay was not sufficient to counteract the upflow of the tides, and as a consequence the water about the islands became strongly saline and in some instances unfit for irrigation.

These conditions, coming suddenly upon the unsuspecting delta farmers, struck them with dismay. Suits were brought and are now pending in the courts to restrain several hundred appropriators from diverting water from the streams above to such an extent as will reduce the stream in the lower sections to a volume insufficient to keep back the tides.

If their efforts prove successful, and the diversions are stopped, it means the abandonment of irrigation on a large part of the upper valley already developed and the extension of irrigation over areas not yet served, at least until storage water is made available.

On the other hand, if the delta farmers are not able to secure the relief they seek, a large part of the most productive lands in the state must be forsaken until some other source of supply can be brought upon them.

The department is fully convinced that other means of irrigation than pumping from the streams alongside can be made available, but that means a large expense which the delta owners would justly feel should not be placed upon them.

Again, to enable them to continue as in the past, drawing a full supply of sweet water from the adjacent streams, the volume must be several times larger than the quantity their lands require, so that, if old conditions are to continue, there must always be several thousand second-feet of water permitted to go to waste in the bay.

There are, roughly, 230,000 acres in the deltas of the Sacramento and San Joaquin rivers combined. Of this, about 42,600 acres are wholly riparian to the Sacramento River, some 33,800 acres obtain water from both the Sacramento and the San Joaquin and its tributary, the Mokelumne; a considerable area draws its water from the San Joaquin after water from the Sacramento has entered the former through Georgian and Three-Mile sloughs, and mingled with the waters of the latter.

So it is not easily determinable how much of the water used for irrigating the delta is obtained from the Sacramento and how much from the San Joaquin.

Nor has any satisfactory data been obtained showing how much water from all sources is required for irrigation of the delta.

It is claimed by some that their lands require a greater quantity than is generally needed for lands elsewhere.

Assuming that it may be four-acre feet and that 20% is applied in the month of greatest use, then to irrigate the 42,600 acres watered by the Sacramento alone and 33,800 acres which irrigates from both streams, will require a constant flow of 1,000 second-feet in July and August.

How much more will be required to hold back the salt tides is not known. The Department and the State Water Commission are making investigations, and so are private interests, so it may be that data may be soon obtained which will give the desired information.

It has been suggested that the delta lands might better be irrigated by taking all the water out above and conveying so much as the lands require in conduits overland.

To this the delta people say that to withdraw all the water from the rivers the bay water will take its place, and that the saline water surrounding the islands will soon percolate through the soil, rendering it alkaline.

Engineers of the Department of Engineering who have given the subject close study, both in the United States and abroad, where similar conditions prevail do not share in the belief that the conditions feared will result if reasonable care be exercised.

To repeat: the conditions which have thrown the entire valley into a tangle of litigation which may continue for a generation, and finally end with disaster to a large population has been foreseen and foretold by the Department. It has repeatedly asked for funds with which to make surveys and investigations of means to avert the predicted catastrophe.

Now that the storm is upon us it is again urged that the Department be enabled to make immediate and thorough search for a remedy.

It takes time to formulate plans, and longer time to construct vast works, and every delay means irreparable loss to the State.

Conflict Between Irrigation and Navigation.

It was long ago predicted by this Department that the increasing diversions of water from the Sacramento River in the upper portions of the valley would so deplete the stream that navigation would be seriously interfered with or rendered impossible.

The diversions for rice culture in the last few years, coupled with a subnormal flow in the rivers has so reduced the volume of water in the channel that navigation was extremely difficult during the two or three summers just passed.

Only by active dredging of channels through shoals and bars was it made possible for boats to reach either Sacramento or points above.

The War Department is charged with the duty of maintaining a navigable depth on the Sacramento River of 7 feet from the mouth to Sacramento, 61 miles; four feet to Colusa, 90 miles; and three feet thence to Chico Landing, 51 miles, a total of 202 miles from the mouth of the river.

In former years a system of jetties placed at strategic points along the stream, together with removal of snags and drifts was sufficient to maintain the required depths and it was very rarely necessary to resort to dredging.

But in the last three years conditions have been very different.

The last report published, for the fiscal year ending June 30, 1919, shows that during that year it was necessary to dredge channels through sand bars between Edwards' Break, four miles below Sacramento and the mouth of the Feather River. The aggregate length of channels dredged was 36,300 feet and the quantity of material removed was 568,713 cubic yards, costing \$30,165.20.

At the same time the entire channel to Chico Landing was cleared of obstructions and a number of wingdams repaired at a cost of \$38,343.45. Making a total expenditure for maintaining navigable conditions, \$68,508.65 for that season.

The year before, 1918, \$71,580.35 were expended in the same way.

In contrast with the above, and as showing the extent of change in conditions in the report of the fiscal year ending June 30, 1915, occurs this passage.

Dredging was resorted to in two places in the Sacramento River. At Sacramento Bend a channel 1000 feet long, and opposite Knox lumber yard, a channel 600 feet long was dredged at a cost of \$1,873.00.

The inevitable injury to navigation due to the abstraction of water for irrigation was foretold by this Department, several years ago.

So far as transportation is concerned, it is not necessary to maintain navigable conditions on the river, and thereby prevent irrigation development of the valley—the very thing which makes navigation desirable and furnishes commerce for it.

It has been pointed out in previous reports that if water transportation be indispensable it can be maintained with a tithe of the water necessary to make requisite depths in the river, by confining it in artificial canals extending, if need be, from tidewater to the limits of the valley.

Already drainage canals and reclamation-levee borrow pits provide much of the waterway needed, which at comparatively small expense can be adapted to the passage of river craft to all points in the valley.

It has been seriously proposed that the river be canalized with a system of dams and locks to enable boats to pass up and down during low water. That system has been extensively used in Europe and is being installed in the Ohio and other rivers in this country.

The scheme is worth investigating and no doubt will be considered by the Government engineers, but the engineers of this Department are not convinced that the verdict will be one of approval, and are quite certain that under the conditions presented, the same results can be obtained in the manner above indicated at a much less cost and without placing obstructions in the river channel to reduce its capacity as a flood carrier. Other streams can be canalized without detriment to their ability to take care of flood waters.

Although the Department is enjoined by law to make surveys looking to the canalization of the rivers of the state and the construction of navigable canals, it has never been furnished with funds to do the work. Such information as it possesses has been obtained incidentally with work done in other lines.

It is desired to urge the necessity of placing the Department in a position to enable it to perform the duty placed upon it by the statutes and seemingly so necessary for the development of the valley.

Conflict Between Irrigation and Power Development.

There is a feverish desire apparent among electric power promoters to acquire rights on the streams of the country far in excess in potenti-

ality of development likely to be fully realized for a great many years. This is caused by a knowledge that the uses of water for power purposes and for irrigation are often antagonistic, and realizing that if the water be once devoted to the latter use its availability for power will be greatly curtailed but if the right to use it for power be first obtained and the need for it for irrigation becomes great, the irrigator must acquire the power rights, and the price to be paid will be based upon the potential profits, even though no plant has yet been built, and the profits are only prospective and perhaps largely speculative.

It has already been stated above that in one instance an opportunity to store water for irrigation has been allowed to escape by the granting of the water for power purposes.

The grant is irrevocable unless the grantor be paid a sum to reimburse him for the profits he would make or thinks he would make from his power venture.

That water, stored up in the winter and used for irrigation in the summer months, would probably develop 250,000 acres of arid agricultural land in the Sacramento Valley or more than twice as much as it can be made to irrigate without storage. And while being used for irrigation it could also be made to develop a large amount of electric energy even though not so much as if used for power alone as is contemplated.

In conclusion of the subject of conflicting uses it is urged that the water resources of the state should be more closely guarded in the interests of the people of the state, and steps taken which will insure the conservation of these resources to the highest uses.

It is the contention of this department that the several uses of water are relative in their importance, and that they stand in this order: (1) Domestic use; (2) irrigation; (3) power; (4) navigation; (5) mining.

For the first two uses there is no substitute, and both are necessary, the one to sustain life and the other to produce food to enable man to occupy the land and prosper.

Electric energy is not only a great convenience but a great necessity, without which man's activities would be greatly limited, but power can be produced by other means than by destroying or curtailing the use of water needed for the first two purposes. Furthermore, there are large volumes of water going to waste in the sea, not now controlled and not available for irrigation, which may be utilized for power purposes.

To be sure, it is in remote regions less easily exploited than sources nearer by. But when it is realized that already electrical energy produced by the waters of northern California is carried to the southern boundary of the state, 550 miles away, and negotiations are being made

to extend the lines 50 miles further, nearly to the Gulf of California, distance does not appear as a barrier to the successful transmission of electricity from the remote regions named to the centers of industrial use, not a third so far away. And let it be emphasized, the state owes it to its people to hold the waters for the greatest use and not recklessly give them away for a lesser use.

Navigation is a cheap means of transportation, but it is pointed out elsewhere that it can be continued without requiring a wasteful use of water. Moreover, if the water required for that purpose can be made to produce abundant crops they can be carried to market, if need be, by railroad and motor truck, albeit at a greater cost, which however, is often counterbalanced by the greater expedition of movement.

The use of water for mining, the last named in the category, has ceased to be a factor in restricting the use of water for other purposes, and need not be discussed.

SAN JOAQUIN RIVER PROBLEMS.

The problems of the control and use of water in the San Joaquin Valley, while similar in many respects to those of the Sacramento Valley, are not so perplexing in their complex relations.

Flood Control and Reclamation.

Little has been done toward bringing about the control of floods in the valley. Lack of effort in this direction is mostly due to the facts that the floods are in lesser magnitude than those of the Sacramento; the river for the most part follows the trough of the valley and has no large basins of rich lands which are occasionally inundated, and the lands are owned in immensely large tracts devoted to stock-raising, in which they are given up to grazing without cultivation, and are not seriously injured by being flooded.

But those vast plains will soon be reclaimed by levees near the banks of the river which, confining the flood waters to narrow limits, will cause so rapid a run-off that engorgement of the delta streams must ensue.

Already levees are being built to reclaim flooded lands and applications have been made to the state to prescribe their location and dimensions so as not to obstruct the passage of floods.

The delta of the San Joaquin River covers more than 300 square miles, all of which was formerly inundated by every winter flood, and a large portion was covered with water daily at every rise of tide in Suisun Bay.

Reclamation of the islands of the delta by levees around their borders began early in the settlement of the valley. The great number of delta channels have usually been able to carry floods without overtopping the

levees, but immunity from danger has been due largely to the fact that the river traversing the long stretch of valley from Mendota to the head of the delta was free to spread over the floor of the valley to a width of many miles, thus retarding the flood-wave so that the lower channels were able to dispose of the water as it came slowly down.

The flood area of the valley north of Kings River is under the jurisdiction of the State Reclamation Board and the Department of Engineering is using its best efforts to obtain data necessary to formulate a comprehensive plan for control of floods as was done for the Sacramento Valley.

Foreseeing that eventually the large holdings would be broken up into smaller tracts for home-building when they and the delta lands would have to be protected from floods, under the authority conferred by the act creating the State Reclamation Board, the Department of Engineering has been steadily prosecuting surveys and investigations to obtain data as a basis for a comprehensive plan of flood control and utilization of the waters of the San Joaquin River and its tributaries.

Some important features of such a plan have already been determined, and if funds are provided, a report can be submitted in the near future, which will indicate means of making present and future reclamation efforts permanent and safe.

It may be said with truth that the completion of the many irrigation projects which recently have taken on such activity will greatly simplify the problem of flood control and reduce the magnitude of the works necessary to effect it.

Navigation.

Although early enactments of the state legislature declared the San Joaquin River to be navigable to Tulare Lake, and Kings River navigable to Smiths Ferry where the town of Reedley is now located, as also was declared of nearly all other tributaries for many miles above their respective mouths, the fact was, that excepting during high water, no vessel larger than a row-boat could have reached the limits of navigation specified in the statutes.

Before the advent of the railroads a considerable commerce by boat was maintained on the San Joaquin as far up as Firebaugh, but it is not recorded that any steamer ever succeeded in reaching Tulare Lake.

In the '70s a small barge equipped with an engine, and dignified by the name of a steamer, plied on Tulare Lake, conveying stock from the mainland to a chain of islands located where the irrigation district and town of Alpaugh now flourish. But automobiles and trucks running on the dry bed of the lake have taken the place of the little pioneer steamer in the commerce of that region.

The present statute (1913, page 538) defines the head of navigation on the San Joaquin River as being at Sycamore Point. This is the location of the Southern Pacific railroad bridge at Herndon, 10 miles north of Fresno. However, no steamer can reach this point at any stage of the river, since Skaggs Bridge, a concrete structure, spans the river nine miles below Sycamore Point. Some 30 miles further down the stream is a dam in the river near Mendota, maintained to divert water into irrigation canals delivering water on the plains of the "west side." This dam has a removable portion, which upon one special occasion in 1911 was opened for the passage of a steamer, the first one to pass this point in 40 years. This dam would be an effective barrier to free navigation to points above unless materially altered in design.

The development of irrigation in the San Joaquin Valley is very much more extensive than it is in the Sacramento Valley and has depleted the flow to such an extent that for several years no water has flowed in the lower reaches of the river excepting seepage and return waters from the irrigated areas above.

While it is in the power of the government to require that sufficient water shall be allowed to remain in the streams to enable navigation to be maintained unimpeded thereon, the authorities of the War Department have never interfered with diversions of water from the river or its tributaries, and thus by tacit consent thereto has practically abandoned the San Joaquin River as a navigable stream, at least throughout the central portions of the valley.

The attitude of the officers of the War Department upon the question of noninterference with irrigation and the interests of navigation on the San Joaquin River has been expressed in a report made to Congress in 1917, and referred to as House Document No. 332, Sixty-fifth Congress, first session. Reviewing this report the Chief of Engineers, United States Army, said:

The paramount interest in this valley is irrigation rather than navigation.

There is insufficient water even if economically used to supply the area that may ultimately become available for irrigation.

There is insufficient low water flow for navigation above San Joaquin Bridge.

San Joaquin Bridge is the Southern Pacific Railroad drawbridge across the San Joaquin between Lathrop and Tracy, about 16 miles by river above the mouth of Stockton Channel.

The report and the endorsement of the Chief of Engineers thereon were reviewed by the Board of Engineers for Rivers and Harbors wherein it was said:

It (the board) confirms the opinion expressed in the report that the dominant interest in the San Joaquin Valley above Stockton is irrigation and not navigation. It recommends * * * that no objection be made by the department (of war) to the diversion of water from the San Joaquin River and its tributaries for irrigation purposes.

The report did find, however, that the return and seepage water from irrigated lands had become sufficient in volume in the lower reaches to warrant the government in improving the conditions there.

Each year since 1917 the government has removed snags and built wing dams to concentrate the low flow so that light draft vessels can operate to Hills Ferry, 86 miles from Stockton, until about August each year.

As a further contribution to the benefits to navigation the Department of Engineering, cooperating with land owners and reclamation districts has done considerable work in bank protection along the river to prevent levee breaks which when they occur always operate to cause shoals in the stream below.

Irrigation.

The San Joaquin Valley contains approximately $7\frac{1}{2}$ millions of acres of arable land all of which needs irrigation to make it productive. It is divided by physical conditions into three parts or basins separated by low ridges: Kern Lake Basin, Tulare Lake Basin and San Joaquin Basin. Kern Lake Basin is the depository of the waters of Kern River. Tulare Lake Basin receives the waters of Kaweah and Tule rivers, a portion of Kings River waters, occasional run-off from foothills south of Tule River, and occasional overflow from Kern River.

Kings River of recent years has been dividing its flood waters between Tulare Lake and San Joaquin River.

The principal tributaries of the San Joaquin are Merced, Tuolumne, Stanislaus, Calaveras and Mokelumne rivers and several minor streams like Fresno River, Chowchilla and Mariposa creeks, etc. All of the streams which contribute measurable quantities of water to the volume in the San Joaquin are on the east side of the valley and have their sources in the deep snows of the high Sierras.

The flow of the streams in the valley varies from 4,660,000 to 19,000,000 acre feet a year with an average of about 11,000,000 acre feet.

It is readily seen that if it were possible to store all of the waters of this drainage, and distribute it with the utmost economy, there would not be enough to irrigate the 7,500,000 acres of land requiring it, and therefore a large acreage must always remain arid unless water can be obtained from sources other than the surface flow of the streams of the valley.

The question of conserving as much of the limited supply and extending it over the largest area possible presents problems for the state to solve and to which the Department acting alone or in cooperation with various public and corporate interests is giving close attention.

An intensive study has been made of the resources of Kings River, the result of which were recently published by the Department, as Bulletin No. 7.

Investigation of flood problems on the Calaveras resulted in a bulletin being issued under the title "Flood Problems of Calaveras River," in which the possibilities of irrigation development from that source for 34,000 acres are treated.

Engineers of the Department have been engaged for several months in investigating the water resources of the Kern River and the best method of their conservation and utilization, a report of which it is hoped will soon be published.

In addition to the above, the Department has made examinations of several projects with sufficient detail to warrant the approval of the organization of irrigation districts during the last two years, aggregating more than a million acres in area.

Many of the districts formed are already irrigated wholly or in part by systems owned by corporations, and the organizations were effected for the purpose of acquiring the works, improving and enlarging them in most cases, and operating them by the people themselves instead of depending upon commercial concerns to furnish the service.

Others, however, are entirely new projects. Some of these enterprises will develop underground waters for their purposes, others will combine underground with surface waters. Some large units contemplate storing flood waters for use as far as it will suffice, create electric power with the water as it descends from the mountains, and with that power pump underground water to supplement the surface supply.

It is not known how much land is under irrigation in the valley as no census has been taken since 1912. Such a census now being made of the state by the Irrigation Inquiry Office of the United States Department of Agriculture is nearing completion and a report will soon be published.

ABSENCE OF CONFLICTS.

Power Development.

Many large plants for generating electric energy from the falling waters are in operation upon all of the major streams of the San Joaquin system and others are being constructed. In nearly all cases the rights have been secured by amicable negotiations between the power companies and others having interest in the water.

Irrigators Versus Irrigators.

Much costly litigation has been had in the courts to determine the relative rights between appropriators, and some are still pending, but in the main the status of rights are being fairly well ascertained, and

a spirit of toleration has to a considerable extent displaced the fierce animosities that formerly existed.

A desire to get together and cooperate in conserving the limited supply of water and in controlling destructive and wasteful tendencies is manifest in the formation of irrigation districts.

Navigation and Irrigation.

The discussion on the subject of navigation hereinbefore sets forth the abandonment of navigation on the San Joaquin in those portions where navigation is affected by the withdrawal of water for irrigation, and the acceptance by Government officials of the doctrine that irrigation is paramount to navigation.

Peaceful Solutions.

It is apparent from the foregoing that the solution of the problems of the San Joaquin are not beset by the complexity of conflicts and warlike opposition between different interests that is so prominent in other portions of the state. In other words, the enormous wastes of conflict in the costs of legal battles and long delays of development have brought sober sense to the various interests in the San Joaquin Valley, with bright prospects of enhanced prosperity throughout the valley in the near future.

COMBINED SUMMER FLOW OF ALL STREAMS ENTERING SACRAMENTO VALLEY.

Year	July acre-feet	August acre-feet	September acre-feet	Total acre-feet	of require- Per cent ments
1905 -----	572,500	430,982	396,356	1,409,838	45
1906 -----	1,432,530	643,630	518,335	2,594,545	84
1907 -----	1,336,260	701,462	644,828	2,682,550	87
1908 -----	687,965	426,681	383,827	1,398,473	45
1909 -----	869,240	545,760	485,900	1,900,900	61
1910 -----	492,104	416,964	400,394	1,309,463	42
1911 -----	1,013,810	619,643	440,906	1,974,359	64
1912 -----	514,335	396,778	452,070	1,363,181	44
1913 -----	522,598	410,230	355,880	1,294,708	42
1914 -----	799,050	618,907	458,172	1,363,181	44
1915 -----	816,068	629,372	473,124	1,818,564	59
1916 -----	810,921	512,563	473,409	1,796,893	58
1917 -----	653,520	450,130	421,267	1,533,917	49
Means -----	801,531	502,108	408,078	1,757,847	57
Per cent -----	64%	56%	43%		
1918 -----	368,527	344,739	417,520	1,130,786	36
1919 -----	424,620	381,589	367,140	1,173,349	38
1920 -----	392,073	324,815	300,648	1,017,541	33
Means -----	395,075	350,381	361,769	1,107,225	36
Per cent -----	31%	39%	38%		

MINIMUM MEAN FLOW IN ACRE-FEET PER DAY OF STREAMS OF THE SACRAMENTO VALLEY FOR THE LOWEST FIVE CONSECUTIVE DAYS IN JULY AND AUGUST 1913-1920.

Stream	1913		1914		1915		1916		1917		1918		1919		1920		Mean	
	July	Aug.	July	Aug.	July	Aug.	July	Aug.	July	Aug.	July	Aug.	July	Aug.	July	Aug.	July	Aug.
Sacramento	10,350	9,100	11,700	10,100	12,100	10,150	10,800	9,830	9,220	8,330	7,310	6,950	8,130	7,400	6,770	6,490	9,550	8,550
Feather	2,720	2,120	3,640	3,300	5,010	3,970	4,820	4,410	4,810	4,580	2,760	3,090	3,820	3,630	3,390	2,780	3,890	3,490
Yuba	883	516	1,345	726	984	714	1,180	656	922	527	447	328	530	324	415	252	838	504
Bear	44	22	203	234	101	101	321	234	30	30	10	10	12	12	8	8	92	81
American	630	500	1,960	440	1,505	476	1,830	462	1,130	555	180	129	268	226	363	276	983	383
Totals	14,627	12,258	18,851	14,800	19,700	15,411	18,951	15,592	16,112	14,022	10,707	10,497	12,760	11,682	10,916	9,806	15,323	13,006

ANNUAL FLOW IN ACRE-FeET OF SACRAMENTO RIVER AND TRIBUTARIES, OCTOBER 1, 1903 TO SEPTEMBER 30, 1920.

Stream ²	1903-04	1904-05	1905-06	1906-07	1907-08	1908-09	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19	1919-20	Mean
Sacramento River	15,000,000	16,070,000	11,100,000	13,700,000	7,930,000	17,400,000	8,010,000	2,010,000	6,370,000	8,840,000	12,560,000	17,100,000	10,700,000	6,950,000	5,170,000	7,500,000	2,850,000	9,920,000
Feather River	9,520,000	4,490,000	6,710,000	9,540,000	3,330,000	7,280,000	4,500,000	4,930,000	2,650,000	2,950,000	7,710,000	3,800,000	6,790,000	4,890,000	2,770,000	3,190,000	2,620,000	7,110,000
Yuba River	1,940,000	2,800,000	3,430,000	4,590,000	1,900,000	3,880,000	2,750,000	3,510,000	1,130,000	1,400,000	2,870,000	2,500,000	3,000,000	2,350,000	1,140,000	1,720,000	1,080,000	2,490,000
Beaver River	538,000	517,000	501,000	720,000	188,000	553,000	250,000	512,000	87,000	107,000	543,000	474,000	475,000	410,000	120,000	800,000	77,000	510,000
American River	5,040,000	*1,984,000	4,767,000	5,710,000	1,450,000	4,540,000	3,510,000	6,480,000	1,390,000	1,450,000	3,550,000	2,050,000	1,550,000	2,800,000	1,850,000	2,150,000	1,410,000	2,500,000
Catch Creek	890,000	628,000	710,000	987,000	207,000	1,200,000	270,000	490,000	30,000	72,000	1,170,000	560,000	660,000	317,000	30,000	100,000	73,000	300,000
Putah Creek	*972,000	*175,000	583,000	691,000	100,000	881,000	228,000	481,000	50,000	151,000	855,000	710,000	700,000	284,000	88,000	115,000	57,000	400,000
Stony Creek	753,000	508,000	535,000	765,000	438,000	810,000	331,000	535,000	127,000	131,000	184,000	560,000	598,000	598,000	177,000	180,000	100,000	*500,000
Totals	27,220,000	21,404,000	35,621,000	36,475,000	13,284,000	37,780,000	20,705,000	28,906,000	11,178,000	12,780,000	31,530,000	26,710,000	26,980,000	17,954,000	10,577,000	15,866,000	8,576,000	22,900,000
Percent of mean	165	85	138	141	68	113	92	138	49	54	139	118	110	70	47	70	79	100

¹Quantity estimated.²Record discontinued October, 1912. Quantities supplied by interpolation.³The "flow-year" begins with the rainy season and is registered from October 1st to September 30th following.

Note: The figures for Bear and American Rivers and for Putah Creek for 1903-04 and 1910-11 were interpolated and are obtained as a proportion of the recorded flow of the nearest neighboring watershed. They are not assumed to be correct but are inserted to show probable totals for years when the record was incomplete. The figures for Catch and Putah Creeks for 1919-20 are estimated from percentage ratios of the flow of these streams to the total flow in the valley for similar years. Comparisons in this case were made by taking a basis of the 1911-12 and 1917-18 ratios.

Records since September 30, 1912, have not been published. The flows for 1917-18, 1918-19 and 1919-20 are provisional, subject to revision for purposes of publication.

STATIONS		PERIOD MEANS			
		Mean flow all-time and			
		Inclusive dates	Period in years	Acre feet	Percent 17-year mean
Sacramento	Red Bluff	1902-1920	17	22,600,000	107
Feather	Oroville	1903-1911	8	27,700,000	122
Yuba	Smartsville	1911-1916	5	21,800,000	96
Beaver	Van Trent	1910-1920	4	17,500,000	79
American	Pear Oaks				
Catch	Yolo				
Putah	Winters				
Stony	Proto				

FLOW OF WATER IN SACRAMENTO VALLEY, 1903-1920.

Stream	Drainage area, square miles	Maximum flood flow, second-feet	Maximum mean daily flow, second-feet	Maximum monthly flow, acre-feet	Minimum monthly flow, acre-feet	Maximum annual flow, acre-feet	Minimum annual flow, acre-feet	Mean annual flow, acre-feet	Available storage capacity, acre-feet
Sacramento River	29,300	278,000	254,000	4,510,000	205,000	15,900,000	3,830,000	9,653,000	1,000,000
Feather River	3,640	187,000	187,000	2,450,000	59,600	9,640,000	2,060,000	5,310,000	775,000
Yuba River	1,220	125,000	111,000	1,410,000	9,600	4,560,000	1,080,000	2,560,000	138,000
Bear River	283	25,800	26,800	296,000	428	728,000	87,600	374,000	69,000
American River	1,910	119,000	106,000	1,520,000	7,320	6,480,000	1,260,000	3,220,000	---
Stony Creek	601	36,000	29,300	391,000	50	894,000	127,000	506,000	144,000
Cache Creek	1,320	20,800	20,100	469,000	---	1,280,000	36,000	521,000	175,500
Putah Creek	805	39,400	39,400	474,000	---	856,000	56,600	430,000	318,000
Unmetered streams	3,907	76,000	---	---	---	---	---	---	---
Valley	4,250	25,500	---	---	---	---	---	---	---

*Quantity estimated.

¹Stony Creek station discontinued October, 1912.²The drainage area of Sacramento River Basin is 10,400 square miles if Goose Lake Basin is included. This area has contributed no run-off since 1881. Previously published data should be corrected when determining rates of run-off per square mile.³Estimated by California Debris Commission as quantity flowing just prior to the destruction of the debris barrier below Smartsville. The maximum recorded at the gaging station was 111,000 second feet.⁴Estimated from 50 per cent run-off of rainfall recorded in area for storm of March, 1907.⁵Estimated from 40 per cent run-off of rainfall recorded in area for storm of March, 1907.

FLOW OF WATER SAN JOAQUIN RIVER BASIN, OCT. 1, 1907-SEPT. 30, 1919.

STREAM	Drainage area square miles	Maximum flood flow second-foot	Maximum mean daily flow second-foot	Maximum monthly flow acre-feet	Minimum monthly flow acre-feet	Maximum annual flow acre-feet	Minimum annual flow acre-feet	Mean annual flow acre-feet
San Joaquin River-----	1,640	46,200	38,800	946,000	16,200	3,560,000	888,000	1,980,000
*Merced River-----	1,020	37,200	37,200	465,000	2,300	2,120,000	441,000	1,036,600
Tuolumne River-----	1,500	52,000	52,600	821,000	3,900	3,410,000	1,050,000	1,940,000
Stanislaus River-----	985	36,900	36,900	491,000	238	2,390,000	494,000	1,230,000
Calaveras River-----	395	69,600	69,600	323,000	-----	675,000	31,400	254,000
Mokelumne River-----	642	16,700	16,700	331,000	3,170	1,530,000	393,000	815,000
Cosumnes River-----	524	22,400	22,400	264,000	131	874,000	127,000	401,000
		281,600			Mean annual flow, 12 years			7,693,600

*Merced River station at Merced Falls was discontinued in October, 1913. In November, 1915, a new station was established at Exchequer, 8 miles up-stream from the old one.

ANNUAL FLOW IN ACRE-FEET OF STREAMS OF SAN JOAQUIN RIVER BASIN, 1907-1919.

Stream	1907-08	1908-09	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19	Mean
San Joaquin River.....	1,140,000	2,900,000	2,040,000	3,560,000	1,050,000	868,000	2,870,000	1,970,000	2,770,000	1,940,000	1,470,000	1,318,000	1,990,000
Merced River.....	518,000	1,480,000	1,140,000	2,120,000	515,000	441,000	1,328,400	988,100	1,263,500	1,130,000	830,000	681,000	1,036,600
Tuolumne River.....	1,070,000	2,650,000	2,080,000	3,410,000	1,050,000	1,080,000	2,620,000	2,040,000	2,350,000	2,220,000	1,460,000	1,338,000	1,940,000
Stanislaus River.....	588,000	1,890,000	1,370,000	2,320,000	587,000	484,000	1,720,000	1,270,000	1,600,000	1,380,000	804,000	749,000	1,230,000
Calaveras River.....	167,200	472,000	195,500	675,000	63,000	31,400	273,000	266,000	344,000	348,000	212,000	101,000	254,000
Mokelumne River.....	480,000	1,150,000	906,000	1,530,000	393,000	423,000	1,080,000	823,000	1,030,000	868,000	521,000	590,000	815,000
Cosumnes River.....	148,000	638,000	468,000	874,000	139,000	127,000	548,000	408,000	572,000	416,000	225,000	259,000	401,000
Totals.....	4,016,200	11,180,000	8,194,500	14,489,000	3,797,000	3,464,400	10,439,400	7,765,100	9,929,500	8,282,000	5,522,000	5,036,000	7,666,600

¹Record incomplete.²Merced River station at Merced Falls was discontinued in October, 1913. In November, 1915, a new station was established at Exchequer, eight miles upstream from the old one. The figures given for 1913-14, 1914-15, and 1915-16 are interpolated.

STATIONS.

San Joaquin.....Friant.
 Merced.....Exchequer.
 Tuolumne.....La Grange.
 Stanislaus.....Knights Ferry.
 Calaveras.....Jenny Lind.
 Mokelumne.....Clements.
 Cosumnes.....Michigan Bar.

FLOW OF STREAMS IN TULARE LAKE BASIN.

Seasonal year	Tule River					Kaweah River					Kings River					Total three streams acre-feet
	Discharge, second-feet			Annual flow acre-feet	Discharge, second-feet			Annual flow acre-feet	Discharge, second-feet			Annual flow acre-feet				
	Max.	Min.	Mean		Max.	Min.	Mean		Max.	Min.	Mean					
1903-04	2,305	7	97	70,300	2,920	40	516	373,000	15,700	130	2,400	1,740,000	2,153,300			
1904-05	822	7	99	71,000	2,730	40	463	338,000	9,795	150	1,970	1,430,000	1,889,000			
1905-06	4,350	8	461	335,000	8,160	40	1,497	1,090,000	26,600	150	5,300	3,860,000	5,285,000			
1906-07	2,300	28	214	154,000	3,400	75	820	594,000	15,600	330	3,790	2,750,000	3,498,000			
1907-08	1,230	6	113	81,406	1,600	42	348	253,000	6,920	265	1,425	1,030,000	1,364,000			
1908-09	5,070	21	397	285,000	9,210	51	1,110	890,000	20,300	285	3,890	2,810,000	3,895,000			
1909-10	5,430	5	162	117,000	7,910	34	481	350,000	14,700	270	2,450	1,790,000	2,247,000			
1910-11	2,780	9	168	121,000	6,610	39	755	546,000	20,500	196	3,900	2,830,000	3,497,000			
1911-12	260	1	69	49,800	2,360	30	285	297,000	12,400	168	1,330	968,000	1,224,800			
1912-13	248	1	40	29,200	1,470	32	305	221,000	7,210	136	1,300	942,000	1,192,200			
1913-14	4,710	2	173	125,000	9,880	30	672	466,000	30,400	186	3,523	2,550,000	3,161,000			
1914-15	1,380	8	142	106,000	3,290	40	511	370,000	16,300	190	2,510	1,820,000	2,293,000			
1915-16	4,080	8	344	249,000	10,100	38	1,060	762,000	16,300	170	4,190	3,040,000	4,051,000			
1916-17	3,540	7	190	138,000	3,280	47	651	471,000	13,200	135	2,610	1,860,000	2,499,000			
1917-18	635	1	55	89,900	2,040	36	317	230,000	12,800	170	1,880	1,360,000	1,629,900			
1918-19	665	5	80	57,900	2,040	28	394	285,000	11,200	160	1,680	1,203,000	1,546,900			
1919-20																
Mean, 16 years				126,700				464,100					2,000,200	2,591,000		

*Discharge at crest, 62,000 second-feet.

Tule River at Portersville.

Kaweah River at Thre Rivers.

Kings River at Peoria.

17-year mean, Kings River

1,965,000

FLOW OF KERN RIVER.

Seasonal year	Discharge, second-feet			Annual flow acre-feet
	Maximum	Minimum	Mean	
1903-04	3,167	150	638	469,000
1904-05	3,039	194	756	548,000
1905-06	9,565	175	2,528	1,840,000
1906-07	4,504	433	1,606	*869,000
1907-08	2,848	272	900	380,000
1908-09	8,851	249	2,400	1,637,000
1909-10	4,676	248	1,020	740,000
1910-11	4,623	243	1,384	1,000,000
1911-12	2,919	360	579	421,000
1912-13	1,976	126	494	358,000
1913-14	18,287	197	1,510	1,090,000
1914-15	4,249	225	917	664,000
1915-16	17,967	203	3,390	2,460,000
1916-17	4,331	291	1,205	872,000
1917-18	3,478	227	712	515,000
1918-19	3,851	163	736	533,600
Mean, 16 years				902,000

*Record incomplete Kern River at Bakersfield.

INLAND WATERWAYS.

The War Department is charged with the care of navigable waters of the country and it delegates officers of the Engineering Corps of the Army to look after navigation interests.

For convenience of administration the country is divided into divisions and districts covering groups of harbors and rivers where navigation is maintained.

From time to time Congress appropriates funds for the improvement of navigable waters according to the plans of the engineers, who then execute the work.

The rivers and harbors of the Sacramento and San Joaquin valleys together with Suisun Bay are in the Third San Francisco District. The officers of this district are charged with maintaining conditions prescribed in several projects approved from time to time by Congress and for which appropriations have been made.

The projects are described in the reports of the Chief of Engineers, United States Army, and are published in pamphlet form as Congressional documents.

Cooperation in these projects does not always obtain between the Federal Government and the State and local interests, excepting where it is necessary to obtain rights of way for changes in natural conditions or easements are required for the deposit of materials removed from the channels, in which cases it is required that such land properties shall be furnished free of cost to the Government.

THE SAN JOAQUIN RIVER.

Projects for Improvement of Navigation.

The projects on the San Joaquin River upon which the Government is engaged at this time are as follows:

(a) To maintain a navigable channel 200 feet wide and nine feet deep from the mouth of the river to the mouth of the Stockton Channel, 42½ miles, and in the latter to its head in the City of Stockton, a total distance of 45 miles.

(b) To maintain a channel 80 feet wide and 4 feet deep in Mormon Channel to Center Street, 1.7 miles.

(c) A depth of 9 feet in Fremont Channel and McLeod Lake, parts of Stockton Harbor.

(d) Cutting off sharp bends and making cut offs in the river.

(e) Improvement of the river above Stockton by partial closing of side channels at Lairds Slough and Paradise Cut by weirs so as to confine low water to a single channel snagging and clearing the river channel and constructing wing dams from the mouth of Stockton Channel to Hills Ferry, 86 miles, so as to facilitate navigation for light draft vessels during part of the year.

(f) Diversion of the waters of Mormon Slough by a dam in the slough and a channel 150 feet wide locally known as the Calaveras Diverting Canal connecting with the north fork of the Calaveras River so as to pass the floods of river around the City of Stockton.

(g) Maintaining navigable depths on the Mokelumne River which has a low water depth of 9 feet from its mouth to Newhope Landing, 27 miles, and three feet depth to Galt Newhope Bridge, the present head of navigation eight miles, making a total navigable length of 35 miles.

Original Condition.

The lower 34 miles of the San Joaquin River have always been broad and deep. The next 15 miles, including Stockton Channel, notwithstanding some sharp bends, and widths in places less than 100 feet, were navigable at low water by boats of six feet draft. Fremont Channel and McLeod Lake were less than 5 feet deep. The great volume of sand and silt carried into Mormon Channel by the Calaveras River interfered with navigation in that channel. The choked condition of the river above Stockton Channel by snags and bars, and the diversion of the water into side channels, rendered navigation impossible for boats drawing four feet of water for more than half the year to Hills Ferry and for only a few months during high water above that point.

Improvement Authorized.

The first authorization of the War Department to attempt bettering conditions was the river and harbor act of August 14, 1876, which was followed by the Acts of March 3, 1881, July 5, 1884, August 11, 1888, July 13, 1892, August 18, 1894 and June 3, 1896, providing for dredging the channels, making cutoffs, snagging, and partial closing of Lairds Slough and Paradise Cut, but without specifying dimensions.

A description of the project for a 9-foot channel to Stockton was adopted June 25, 1910;¹ for the improvement of Fremont Channel and McLeod Lake, July 25, 1912;² and for the Calaveras Diverting Canal, June 13, 1902;³ while the Mokelumne River project was adopted July 5, 1884, as described in the annual report, Chief of Engineers, U. S. Army, 1882, p. 2637.

In the projects for improving the river below Stockton fourteen cutoffs across bends were included, besides straightening the channel by cutting off projecting points of land, thus shortening the length of navigable channel no less than six miles.

The State made three of the cutoffs required several years ago and the Government also completed the weirs at Lairds Slough and Paradise Cut, the Calaveras Canal and the remaining river cutoffs. Of recent years the work required has consisted of deepening and widening

¹H. Doc. 1124, 60th Congress, 2nd Session.

²H. Doc. 581, 62nd Congress, 2nd Session.

³H. Doc. 152, 55th Congress, 3rd Session.

constructed portions of the channel to project dimensions, and straightening salient points.

The State has from time to time appropriated funds for the procurement of rights of way for easements for the deposit of material dredged from the channel.

The right of way for the Calaveras Diverting Canal was procured by funds furnished by the State and the City of Stockton jointly.

In some cases where points of land were cut off to straighten a channel, the land required has been donated by the owner as has also certain easements for soils deposits.

There are yet stretches to be straightened, and others not as wide or deep as called for in the projects.

Expenditures.

During the two years ending June 30, 1919, which is the latest date of reports available, the officers of the Third District have expended for new work and maintenance upon the San Joaquin River system the following sums:

San Joaquin River and Stockton Harbor.....	\$47,156 39
Calaveras Diverting Canal.....	2,900 37
Mokelumne River.....	2,500 00
Total	\$52,556 76

The total expenditures made by the Government upon all of the above projects since the adoption of the first in 1876, including the above figures, have been as follows:

San Joaquin River and Stockton Harbor.....	\$787,722 60
Calaveras Diverting Canal.....	253,377 90
Mokelumne River.....	34,000 00
Total	\$1,075,100 50

THE SACRAMENTO RIVER.

The projects for navigation on the Sacramento River, falling within the Third San Francisco District, are defined by several Acts of Congress.

Original Conditions.

According to the reports of the army engineers¹ formerly the controlling navigable depths at low water were: Four feet below Sacramento City, a little more than three feet to Colusa, less than three feet to Chico Landing and less than one foot to Red Bluff.

Nests of snags nearly blocked the river above Colusa.

¹House Documents, No. 186, 55th Cong. 2nd Session; No. 48, 55th Cong. 3rd Session.

²H. Doc. No. 76, 62nd Congress, 1st Session.

Steamers were unable to reach Sacramento at low water without lightening their cargoes.

Improvements Authorized.

The first project for the improvement of the river was adopted in the River and Harbor Act of March 3, 1875, and modified by the Acts of August 7, 1882, December 21, 1889, July 13, 1892 and August 18, 1894.

Projects Adopted.

The existing project was adopted March 3, 1899¹ for the river below Sacramento, and July 25, 1912² for the upper portion.

The projects provide for the following depths:

From the Mouth to Sacramento	60.7 miles—7 feet
Sacramento to Colusa	90.0 miles—4 feet
Colusa to Chico Landing	51.3 miles—3 feet
Chico Landing to Red Bluff	52.4 miles—such depths as practicable.

The total distance from the mouth of the River to Red Bluff, which is designated as the head of navigation, is 254.4 miles.

Although Red Bluff is the legal as well as physical head of navigation, it is said that on rare occasions before the days of the railroad and the construction of fixed bridges across the river, steamers succeeded in reaching Fort Reading near the present town of Redding, some forty miles above Red Bluff.

It should be borne in mind that the function of maintaining the foregoing depths for navigation by the officers of the Third District is entirely independent of the work of the Debris Commission in carrying out the projects of flood and debris control in the Sacramento Valley, albeit the officers in charge of navigation constitute the Debris Commission and the work executed by the latter will contribute materially to the success of the efforts of the former when the works shall have been completed.

The methods of attaining the objects of the project to maintain navigable depths are:

Snagging and removing drifts and other obstructions from the channel; construction of jetties and wing dams to direct and concentrate the current of low water; dredging channels through obstructing sand bars.

The succession of dry years since 1913, with the unprecedented increase of diversions of water for irrigation, have so reduced the natural summer flow of the water as to greatly increase the labor and costs of maintaining the project depths.

Operations of War Department.

The operations between the mouth of the river and Chico Landing during the two years ending June 30, 1919* the latest date for which figures available are as follows:

Snags removed.....	5,203
Drifts and other obstructions.....	7,930
Overhanging trees removed from banks.....	4,965
Total obstructions removed.....	18,098

There were four wing dams, aggregating 728 feet in length, constructed, and 36 wing dams repaired and reconstructed.

Fifteen cuts through sand bars between Edwards Break, four miles below Sacramento, and Collins Eddy, aggregating 43,210 lineal feet, were dredged, removing 651,366 cubic yards of material.

The total cost, including surveys and soundings for the two years, was \$143,333.42.

Feather River Project.

The Rivers and Harbors Act of July 27, 1916, adopted a project to provide a navigable depth of 2½ feet from the mouth of Feather River to Marysville, 28.3 miles, by snagging, wing dams and dredging.

An appropriation of \$10,000 was made by the Act, contingent upon a like sum being provided by local interests. This condition was complied with by subscriptions of \$2500 each from Sutter and Yuba counties and an allotment of \$5000 from the funds of the Department of Engineering.

The work executed in the two years covered by the report above mentioned amounted to \$4,730, which, with previous expenditures, makes a total of \$6,164.71 expended from the fund.

Expenditures.

The foregoing statement of the expenditures made by the Government in the interests of navigation, together with expenditures previously made, are as follows:

Sacramento River: Amount expended to June 30, 1919.....	\$1,378,565 11
Feather River: Amount expended to June 30, 1919.....	6,164 71
Total.....	\$1,384,729 82
San Joaquin River and tributaries, (pp. 68-70).....	\$1,075,100 50
Total expended in both river systems.....	\$2,459,830 32

*Report of Chief of Engineers, U. S. Army, 1918, pp. 1712-13; *ibid.* 1919, pp. 1802-3.

COMMERCIAL STATISTICS.

San Joaquin and Sacramento River Systems.

PHYSICAL FEATURES.

San Joaquin River.

Place	Miles from mouth	Range in feet				
		Mean tidal	Extreme tidal	Ordinary flood	Extreme flood	Navigable depth
Collinsville		5.8	7.0	8.0	9.9	-----
Stockton Channel	42.5	3.0	4.0	8.5	13.7	9
Stockton	45.0	3.0	4.0	8.5	13.7	9
San Joaquin Bridge	58.5	1.1	1.5	17.0	21.0	5
Hills Ferry	128.5	-----	-----	12.0	16.0	3

Mokelumne River.

Place or section	Distance in miles	Navigable depth, feet
Mouth at junction with San Joaquin to confluence North and South forks.....	4	9
North Fork to Snodgrass Slough	8	9
North Fork to head of South Fork	1	6
South Fork to head of North Fork at Newhope Landing	11	9
Newport Landing to Galt-Newhope bridge	8	3

Sacramento River.

Place or section	Distance, miles	Mean tidal	Extreme tidal	Ordinary flood	Extreme flood	Navigable depth, low water, feet
Mouth at Collinsville		15.8	7	8	9.9	-----
To Sacramento	60.7	12.75	11.25	20	30	7
Vernon	81	-----	Trace	20	24	-----
Colusa	150.7	-----	-----	25	32	4
Chico Landing	202	-----	-----	20	25	3
Red Bluff	254.4	-----	-----	24	20	Variable

¹Mean lower low water to mean higher high water.²Tide at low water season only.

Note—This is for 1918. Tides for later years are not published.

Feather River.

Place or section	Distance, miles	Navigable depth, feet
Mouth at Vernon twenty miles above Sacramento—		
Marysville	28.3	2.5

Vessels Engaged in River Traffic, 1918.

Class	San Joaquin and Mokelumne rivers		Sacramento and Feather rivers	
	Number	Net tonnage	Number	Net tonnage
Registered:				
Steamers	29	8,940	33	11,563
Gasboats	112	2,853	71	2,264
Sailing	11	606	15	639
Unregistered:				
Gasboats	46	209	40	186
Sailing			2	10
Unrigged (barges, etc.)	39	8,791	42	11,427
Unrigged (tonnage not reported)	28		16	
Totals	265	21,399	219	26,089

Statistics of River Commerce.

Year	Freight		Passengers
	Tons	Value	
San Joaquin River:			
1913	820,399	\$38,341,174	
1914	772,156	35,474,741	207,249
1915	831,234	36,358,240	189,667
1916	824,222	42,179,160	182,486
1917	611,581	50,322,786	206,131
1918	766,236	65,256,292	236,379
Mokelumne River:			
1913	90,585	5,079,392	
1914	69,783	3,045,870	1,459
1915	88,624	4,033,690	1,994
1916	80,871	5,202,487	15,841
1917	78,054	6,806,410	18,960
1918	67,949	6,135,575	17,290
Sacramento River:			
1913	733,594	35,856,791	
1914	721,090	38,211,760	175,485
1915	766,935	38,027,703	191,416
1916	875,780	46,908,093	115,666
1917	947,690	96,820,992	53,797
1918	1,053,510	113,991,123	112,206
Feather River:			
1913			
1914			
1915	2,903		
1916	392		
1917	135	13,595	
1918	287	25,210	
The total traffic on both river systems for 1918 appears as follows:			
San Joaquin and Mokelumne	834,185	71,391,867	253,669
Sacramento and Feather	1,053,797	114,016,333	112,206
Totals	1,887,982	\$185,408,200	365,875

CANALS AND CANALIZATION.

One of the duties of the Department of Engineering is to investigate the feasibility of extending navigation by canalizing the rivers and constructing canals for navigation throughout the State.

The Department has never had funds for this purpose and most studies that have been made were incidental to the pursuit of other duties, such as surveys for flood control, reclamation and drainage.

In studying the layout for levees and by-pass channels the adaptability of their location for the construction of navigation canals was kept in mind. Throughout the flood areas of the Sacramento and San Joaquin valleys are extensive systems of levees to protect the lands from inundation.

In the delta regions of the San Joaquin and in the several flood basins of Sacramento Valley, extending nearly a hundred miles, or half way up the valley, most of the levees built in late years were constructed by large floating dredges—boats bigger than any river steamers—floating in the channels they made in excavating earth for the levees.

Among the delta islands are many miles of these dredge cuts which are regularly used by the river craft engaged in transporting the products of the land.

Some of the cuts in the Sacramento Valley, particularly in the lower basins, where the tides operate to keep water in them, are kept open for the movement of dredges, pile drivers and gas boats. Bridges across some of these are provided with movable sections to permit the passage of vessels, notably the San Francisco and Sacramento (electric) Railway below Ryde and the Causeway on the State Highway between Sacramento and Davis.

All of these dredge cuts or borrow pits can be readily converted into canals for water transportation.

As they extend toward the interior and the terrane rises different levels must be provided by dams and locks.

For a hundred miles inland the floor of the valley rises at the rate of six to nine inches to the mile. With lifts of six feet this gradient would require locks every eight to ten miles. For nearly half that distance there would be no difficulty in making a tide-level canal of dimensions for the admission of ocean ships. Such canals, without locks, can be constructed from deep water on the east side to Sacramento and west up the river as far as the Southern Pacific Railroad near Lovdal Station.

It is equally practicable to construct ship canals to Stockton and to the head of the delta near Banta. Beyond these points on either route would require lifts to higher levels.

The Department has made a field survey for a ship canal from deep water to the city of Sacramento, a report upon which is in preparation. In this case it is found that the largest item of cost is the price demanded for right of way through highly developed farms.

Studies made by the Army engineers and also by the engineers of this Department for a ship canal to Stockton have found the same high price of land obtains along that route also.

To enable estimates to be made of the probable cost of construction, detail studies must be made of each unit or project, based upon field surveys, none of which has been made by this Department excepting in the one case above cited, and in that the Sacramento Chamber of Commerce provided a large part of the funds.

Studies on the subject, however, have convinced the engineers of the Department that it is engineeringly feasible to construct sea level canals for ocean-going ships from deep water to thirty or fifty miles inland and with locks to extend them further. It is engineeringly feasible to convert existing channels and construct connecting links so as to have a net work of large canals to all sections of the valley regions, and it is known that all of this can be done at a cost far less than other countries have expended for like transportation facilities.

It is not regarded as a proper function of this Department at this time to discuss the industrial phases of the larger question of extending water transportation by artificial means.

Canalization of Rivers.

Some years ago a movement was started in the southern portion of the San Joaquin Valley looking to the restoration of navigation on the San Joaquin River to the vicinity of Fresno. By action of both Congress and the Legislature funds were provided to the extent of about \$65,000 with which the War Department made a complete survey of the San Joaquin to the official head of navigation at Sycamore Point, eleven miles from Fresno. The report was that where the interests of irrigation are served there would not be water for navigation, even with an expensive system of dams and locks, and as irrigation is a paramount use for the water recommended that the scheme be not considered.

No study was made of the possibilities of utilizing large canals for water transportation.

The rapid increase of irrigation in the Sacramento Valley in the last two or three years, resulted in the depletion of the natural flow of the river to such small volume that not only was navigation on the stream impeded, but farmers who had long enjoyed the use of water for irrigation were put to much inconvenience, and they allege to much injury.

That condition has led to agitation for the canalization of the Sacramento River throughout its course in the valley. Canalization is the term used for creating a series of pools in a river by means of dams at suitable intervals so that a greater depth of water will be created than is afforded by the natural flow.

These pools, being at different levels, progressively higher going up-stream, must be provided with locks to enable vessels to pass from one pool to another.

In streams with limited flood-carrying capacity and where great floods occur, such as the Sacramento River, the dams must be of a type that permits of their being removed or laid down before the approach of floods in order that they will not offer obstruction to the flow of flood waters.

Canalization is resorted to very largely in Europe and to some extent in this country. The most notable example in the United States is that of the Ohio River wherein the government is engaged in the construction of 54 dams, with accompanying locks, between Pittsburg and the mouth of the river. These great structures, many of which are constructed, cost about a million dollars each.

It seems probable that the War Department may soon undertake a survey of the Sacramento to determine whether canalization is feasible. The great flow of debris in the river may present a serious problem which will have to be studied.

A Dam in the Bay.

It has been proposed that navigation in the lower reaches of the river can be benefitted and the problem of protecting the delta irrigators from salt sea-water solved by building a dam across some narrow place in the bay below the debouchment of the rivers. This, it is claimed, would impound the fresh waters for a sufficient depth for navigation for a long ways above the dam; would keep back the salt water and store a vast amount of fresh water for irrigation and domestic use; and incidentally provide protection to all wharves and other structures of wood from marine borers.

The scheme for a dam across the bay has a prominent precedent in the reclamation of the Zuyder Zee in Holland. The Zee is an arm of the ocean similar in many respects to the Suisun Bay but much larger. Work is now in progress building a dam 18 miles long to divide the Zee into two parts. The southern portion, extending to Amsterdam, to be cut off from the other when the dam is completed, will become a lake of more than 1300 square miles in area. It is designed to build dykes enclosing more than a half million acres of the lake from which the water will be pumped and the uncovered bed of the sea converted into cultivated farms. These below-the-sea lands are called "polders."

It is expected that in a short time the enclosed sea water will be displaced by fresh water from the Ysser River, a branch of the Rhine, and then the fresh water will be available for the irrigation, not only of the polders created by the enterprise, but of other lands as well.

In view of what has been done elsewhere it is hoped that both the canalization of the river and the project for a dam across the bay will be thoroughly investigated. The Department of Engineering will gladly cooperate with Federal agencies, or if the Government cannot be induced to move in the matter it is urged that it would be worth while to put the Department in a position to make the investigations.

RIVER CONSTRUCTION WORK.

The succession of dry years which the state has just experienced during which no floods have occurred to overtop the river banks has made little work necessary in maintaining the integrity of the levees.

The unprecedented low water in the navigable streams, however, is the more susceptible to violent agitation from moving boats, and in many places the wave-wash has undermined the banks so that breaches would likely occur with the first high water if repairs were not made.

Continued low water leaving the banks exposed has materially aided in the work of placing protection on the slopes.

While several places have needed and received attention a few have required work of enough extent to warrant description.

SACRAMENTO RIVER.

Edinger-Johnson Levee.

Erosion at this dangerous place became so bad that a breach was believed to be imminent in case of high water.

The erosion had extended into the highway on the levee and for a time all travel was suspended.

A break here would divert a large part of the river into the Sacramento Basin to the injury of navigable conditions on the river below the break and of Snodgrass Slough, as well as to destroy large and valuable property.

The bank was revetted by placing a blanket of brickbats on the slope. Some small caves were filled with orchard prunings held in place with wire. The cost was \$4363.61, paid one-third by the state and two-thirds by the adjacent property owners and Sacramento County.

Three Mile Slough.

The bulkhead protection in whirlpool bend was damaged by a drifting dredge in October, 1919. Repairs were made to the extent of driving

twelve piles and placing 300 cords of brush at a cost of \$2,066.77. This was entirely at state expense.

Lower Sherman Island.

In providing rights of way and easements for dredging operations in connection with enlarging the lower reaches of Sacramento River as a part of the great flood control project, the state acquired title to about 3500 acres of low lands on Lower Sherman Island. These lands are, or will be, covered by the materials dredged from the enlarged river channel. As the tailings settle and become drained, most of it will become valuable agricultural land. Indeed several hundred acres are being cultivated by the wards of the state confined in state institutions, and the results have been so promising that the State Board of Control is preparing to utilize all of it in the same way.

The levees along both the Sacramento and San Joaquin rivers had become badly eroded and were threatened with destruction.

At the request of the Board of Control, temporary protection to the levees is being executed sufficient to hold it until funds can be provided for permanent work. This work will be completed before the New Year.

Peat Fires.

Tenants on the state lands on Lower Sherman Island and trespassing hunters frequently allow fires to get into the peat soils, and unless they are quickly subdued large areas of the land would become destroyed. Several such fires have been discovered and extinguished by the Department's crews working in the vicinity. The cost of extinguishing one such fire was in excess of \$500 which the Board of Control is undertaking to recover from those responsible for it.

Tyler Island.

Caving banks on Tyler Island along Georgiana Slough were reaching the danger point, and as the slough is an important highway between the delta and Sacramento River points, the banks were restored and revetted at a cost of \$830.05, two-thirds being paid by the adjoining property owners.

FEATHER RIVER.

Some years ago the state had made a cut-off at Nelson Bend which improved conditions for both navigation and flood control. The major flood control project involved relocation of levees around the bend on the west side. The adjacent reclamation districts had partly accomplished this when their funds were exhausted. The old levees had become badly dilapidated and it was feared that high water would cause a breach here which would cause a radical change in river conditions.

The district being unable to continue its construction until additional funds could be raised by assessments, the Department employed the district contractors to repair the old levees and connect them to the new, so as to complete the barrier at a cost of \$2,500.

SAN JOAQUIN RIVER.

Rough and Ready Island.

In obtaining rights and easements for straightening the channel of the river along the Rough and Ready Island shore, the state incurred obligations to protect the banks and levees, for which \$16,000 was allotted from state funds.

Wave-wash from passing traffic attacked the slopes and endangered banks. Two places were particularly vulnerable, one along the waterfront of the Guernsey farm opposite the confluence of Stockton Channel and the other at the Lindley farm farther down stream.

At the Guernsey place, a stretch of 985 lineal feet was treated with a reinforced gunite slab placed on the slope. A toe wall of the same material was extended vertically 3 feet below the lower edge of the slab.

Owing to the tidal fluctuations of the water, the progress of the work was intermittent, sometimes only a few hours a day being possible. These conditions made the work relatively expensive.

The cost of laying 18,700 square feet of gunite slab was \$7,835.95 or at the rate of 41.8 cents a square foot.

The cost was borne equally by the state and the adjoining property owner.

Prospective work by the government in correcting the alignment of the bank along the Lindley farm caused a postponement of the projected protective work there until the government dredge shall have finished. It is expected to resume operations in December next.

The San Joaquin River, in the vicinity of the bridges across the San Joaquin between Lathrop and Tracy, has a constant tendency to break away its banks, and a break in this vicinity would result in great injury to navigation of the stream below, as well as the destruction of valuable property. It has been the policy of the state to prevent such a catastrophe by maintaining the integrity of the banks and levees. To that end quite extensive protection has been installed with brush mattresses.

San Joaquin Bridge.

In 1919, at three places above the bridge, viz, New Banta Reclamation District, Russi ranch, and Finck and Moreings ranch, mattresses were laid to hold the banks. The total cost was \$7,536.38, paid one-half by the state and one-half by the property owners.

Reclamation District No. 17.

Conditions about the head of Walthal Slough have been growing steadily worse for some time but the Department has not felt justified in expending its meager funds in remedial measures.

Having finished most of the work in contemplation, and having little to keep the crew and equipment employed, arrangements were effected whereby the property owners are to pay all of the costs of quite an extensive work.

Owing to a tendency to undercut at the foot of the bank slope, it was deemed necessary to protect the bottom of the channel for some distance out from the bank. To effect this, a brush mattress about 30 feet wide was laid in the bottom, and extending up the slope nearly to low water line. Above low water, the bank is sloped $1\frac{1}{2}$ to 1 and covered with a reinforced concrete slab 16 feet wide.

The length of work accomplished to October 31 was 944 lineal feet, costing about \$10,000. The work is still in progress, there being about \$6,000 of the fund contributed by the district remaining to be expended. The Department has not expended state funds on this work.

NEW EQUIPMENT.

Much of the equipment for river work is very old. The quarter-boat particularly is badly dilapidated. Plans have been prepared and submitted for bids for a new hull to which the housing will be transferred. The old hull will then be repaired and used for a work barge to haul brush and other materials.

FLOOD CONTROL OPERATIONS.**SACRAMENTO VALLEY.**

The work required of the Department of Engineering in connection with the Reclamation Board's administration of the drainage district in the Sacramento Valley is to prescribe location and dimensions of levees and drainage channels, and where such are all ready existent to mark their height or depth, width, slopes and character of structures therein, all according to the plans heretofore adopted.

This section is also engaged, as time and opportunity are found, in investigating and studying details for those portions of the project which have not yet been completed, principally on the Feather, Yuba and American rivers.

During the biennium just past the Flood Control Section has been engaged in the Sacramento Valley in making surveys to bring levees to prescribed height and dimensions along both banks of the Sacramento River at several places between Jacinto, Glenn County, and the mouth of Steamboat Slough, Solano County; in the platting of profiles of the

river as it was at several periods in the past; in making surveys and studies for a flood control project for San Joaquin Valley.

In the chapter devoted to river construction the surveys for construction in the flood control project of the Sacramento were detailed. Progress of investigations by the Flood Control Section not named therein are epitomized as follows:

SAN JOAQUIN VALLEY.

Mokelumne River.

Surveys and computations made for a bypass to relieve the lower river in times of excessive floods. Computations to determine probable minimum floods, studies for flood control reservoir, enlargement of river channel, etc.

Calaveras River.

Surveys and computations for location and dimensions of flood channel and levees to confine floods to the channel. Computations for modifications in connection with reservoir control, as suggested by report of Harry Barnes published by the Department.

Kings River.

Some flood measurements were made in cooperation with the State Water Commission.

San Joaquin River.

Surveys and computations for a flood channel and control levees from confluence of Stanislaus River to the head of the delta at Paradise Cut, and for a portion of Stanislaus River.

Computations for flood plane and channel capacities for by-pass through the San Joaquin Delta.

Computations for dimensions for a by-pass from Paradise Cut approved by the California Debris Commission.

Survey for a by-pass through the lower end of the delta.

The foregoing studies, excepting where otherwise stated are not complete and are being followed up by the section.

Low Water Measurements.

During the summer the hydrographic force were pressed into the service of the Irrigation Division to make measurements of low flow at various points on the Sacramento River particularly in the tidal sections and on the San Joaquin River at San Joaquin Bridge.

Much of this work was made possible by the financial cooperation of litigants in a suit to determine relative water rights which is now pending in the courts. The results of the measurements were desired by both parties to the suit.

Preparations for Flood Measurements.

In anticipation that the dry cycle has been completed and floods are due for the coming winter, automatic registering gages have been installed at various points in the Sacramento River from Gianelli Bridge below Tehama to the confluence of Feather River; on Feather River and in Sutter Basin.

Preparations are completed for measuring the flood flow at any time it may occur at all of the points.

SAN FRANCISCO HARBOR FRONT.

The harbor front of the city of San Francisco is state property and is administered by a Board of State Harbor Commissioners, which has jurisdiction over the construction, operation and maintenance of the docks, wharves, buildings and appurtenances of every kind. The board reports directly to the Governor.

All engineering, including design and construction, is by law placed in the Department of Engineering, and is exercised through a chief engineer of the Board of Harbor Commissioners appointed by the Department.

Although the city of San Francisco has endeavored to procure the transfer of the harbor front to the city any effort to effect such transfer will doubtlessly meet with strong opposition.

While this Department takes no part in political matters it may take the liberty to point out that the state stands security for several millions of dollars of harbor front bonds.

It is true that interest and other charges on account of the bonds have heretofore been met by the revenues from the harbor but the state is obligated to meet any defaults that might occur.

It is submitted that so long as the state's credit is pledged for the payment of interest and principal of the harbor bonds it would only be a prudent business policy for the state to retain control of the property until the obligations against it are canceled.

Mr. Frank G. White was appointed Chief Engineer July 7, 1916. In his report, extended abstracts of which are herewith presented, it will be observed that work of extending the harbor facilities of the port has been steadily prosecuted.

The most prominent features of new development is the construction of wharves and buildings adapted to the fishing industries, extensions and improvements of the belt railway which now has more than 54 miles of track, and an oil terminal.

The great increase in imports of vegetable oils from the Orient has made it imperative that every Pacific port shall have facilities for

handling these commodities, and the equipment installed will do much to hold trade that without such facilities would go elsewhere.

Studies for the development of Islais Creek and India Basin are discussed, and reference made to plans which it is regretted cannot be reproduced at this time. For details of the last two years' work reference is made to the following:

ABSTRACT FROM REPORT OF CHIEF ENGINEER.

San Francisco Harbor, July 1, 1918 to June 30, 1920.

At the time of the presentation of the last biennial report on July 1, 1918, there were under construction the following structures:

Pier 31, which was 97 per cent completed;

Pier 3 shed, bulkhead building and passenger building, which were 40 per cent completed;

Pier 33, which was 87 per cent completed;

Viaduct across the Embarcadero.

This work was all described in the last report and the structures have all been completed and placed in service.

The construction of Piers 3, 31 and 33 completed the program of new pier construction along the active waterfront from Channel Street to Taylor Street, with the exception of Pier 1 just north of the Ferry Building. This development has more than kept pace with the increase in tonnage, and therefore it has been unnecessary to begin the construction of any new piers during the last two years. The activities of the Engineering Department have been devoted principally to the construction of several pier and wharf additions, pier sheds and other buildings, a vegetable oil terminal, in the maintenance of the waterfront structures, and in making studies of plans for the development of the Islais Creek-India Basin district and of the property at China Basin.

For the purposes of this report, the work of the Engineering Department will be divided as follows:

1. Construction, piers, wharves, etc.
2. Buildings.
3. Oil terminal.
4. Maintenance and repairs.
5. Belt Railroad.
6. Paving.
7. Electrical.
8. Dredging.
9. Testing.
10. Designing and drafting.
11. Future development.
12. Recommendations.

1. CONSTRUCTION, PIERS, WHARVES, ETC.

Pier 43, Addition. An irregular shaped addition on the end and easterly side of Pier 43 was constructed for use in the handling of lumber and other bulk cargoes. This extension is of creosoted pile and timber construction and has an area of 41,100 square feet. One railroad track was extended to the end of the pier which now has an area of 75,928 square feet. The addition was completed in September, 1919.

Pier 21, Addition. Pier 21 was extended to the pierhead line by the construction of a creosoted pile timber structure with a wooden shed. The addition is 108 feet in width and 200 feet in length and carries one railroad track. The work was completed in March, 1919.

Pier 25, Addition. Pier 25, which was 600 feet in length was extended to the pierhead line. The addition is a creosoted pile timber structure, 134 feet in width and 200 feet in length with one railroad track. The construction of the extension was completed in December, 1919.

Pier 20, Addition. An extension 111 feet in width and 160 feet 0 in. in length is under construction at the outer end of Pier 20. The addition will not extend to the pierhead line on account of the depth of the water and soft mud at this location. Some silting has occurred since the construction of Piers 24 and 18, and

it is expected that in time the filling will be sufficient to permit of extending both Piers 20 and 22 to the pierhead line. Work in the addition to Pier 20 was just commencing on June 30, 1920.

Bulkhead Wharf, Pier 5. A section of reinforced concrete bulkhead wharf 45 feet in width and 311 feet in length is under construction adjacent to Pier 5. This will connect the completed sections adjacent to Piers 3 and 7, and the permanent bulkhead wharf will then be continuous from Pier 42 to Pier 19.

This wharf is a typical reinforced concrete pile structure and carries a railroad track leading to the south side of Pier 5. Under a simultaneous contract a depressed railroad track was constructed extending about one-half the length of the pier affording at this point an additional connection with the Belt Railroad.

Also in connection with this wharf a creosoted pile addition is being built in the slip between Piers 5 and 7. This addition will widen the wharf 16 feet and will permit of the construction of a bulkhead shed 49 feet in width. The slip is 174 feet in width and this berth will furnish accommodations for one or more of the smaller bay and river lines.

The track addition to Pier 5 was completed in May 1920 and the bulkhead wharf was 53 per cent completed on June 30, 1920.

Bulkhead Wharf, Pier 27. In order to permit of relocating the railroad track leading to the north side of Pier 27 a section of bulkhead wharf was constructed extending across approximately the northerly half of the pier. A second section is now under construction from this first section to Pier 25. These wharves are of typical reinforced concrete pile construction of a creosoted pile addition 40 feet in width extending from Pier 25 to Pier 27. This will permit of the construction of a bulkhead building 70 feet in width which will be used in conjunction with Pier 27 for handling the large shipments of potatoes and onions from river points.

The first section of the bulkhead wharf at Pier 27 was completed in March, 1919, and the second section with the extension was 28 per cent completed on June 30, 1920.

Wharves, Fishermen's Lagoon. Several wharves for use by the fishing industry were constructed in Fishermen's Lagoon. These wharves have a total length of 1380 feet and an average width of 30 feet. They are built on creosoted piles with concrete decks or with timber decks covered with asphalt. These wharves were built by the Board's construction organization.

2. BUILDINGS.

Pier 31, Shed. The contract for the shed on Pier 31 included the construction of a building over the bulkhead wharf and connecting wharf between Piers 31 and 29 and across the end of Pier 29. The buildings are timber frame structures; the front facing on the Embarcadero is of cement plaster on metal lath and the other walls are of reinforced concrete. All of the openings are closed with steel rolling doors and the windows are steel sash glazed with wired glass. The buildings were completed in May, 1919.

Pier 33, Shed. The shed on Pier 33 is of the same construction as that on Pier 31. The bulkhead building connects with the one previously constructed in connection with Pier 35 making a continuous front 622 feet in length.

An important feature of the sheds on Piers 31 and 33 and of all sheds of recent construction is the use of a series of separate monitors or pent houses on the center section of the roof with windows on four sides. This construction permits the entrance of light from every direction and the result is exceptionally well lighted pier sheds.

The building on Pier 33 was completed in September, 1919.

Pier 41, Bulkhead Building. In 1918 a shed was built on Pier 41 but it did not cover the inner end of the pier on account of the location of rock bunkers at that point. In May 1919 these bunkers were moved to the bulkhead wharf between Piers 41 and 43 and the shed on the inner end of 41 and the adjacent bulkhead wharf was constructed. This building has a frontage of 354 feet on the Embarcadero and adds 28,500 square feet of covered space to the pier shed. The length is now 1,062 feet and the width 160 feet, making this the largest pier shed on the waterfront. The shed on Pier 41 was completed in September, 1919.

Post Office Addition. In order to facilitate the handling of the growing business of the postoffice an addition was built on the second floor along the south side of the existing building. This addition is of steel, concrete and brick construction of the same type as the original building. It is 34 feet in width and 104 feet in length, and was completed in February, 1919.

Fish Packing Houses. Three fish packing houses were erected adjacent to Fishermen's Lagoon for use by companies which operate steam fishing tugs. One of

these is a two-story building which is located near the foot of Taylor Street. It is 47 feet in width and 100 feet in length, and was constructed of reinforced concrete on a concrete foundation. The first floor contains an office, retail market and packing department, and the second floor is used principally for the storage of boxes, gear, etc.

The other two packing houses are located fronting on the westerly extension of the lagoon between Leavenworth and Hyde streets. They are of timber construction, 50 feet in width, 340 feet in length and one story high. They contain offices and packing departments and storerooms but no retail markets.

The reinforced concrete building was completed in March, 1919. The timber building was constructed under two contracts, one of which was completed in June and one in September, 1919.

Boat Shops. A building which is used for two boat builders' shops was constructed facing Fishermen's Lagoon at Jones Street. The building is 80 feet in length by 50 feet in width and is of frame construction. The boatways from the lagoon are directly in front of the building and the shops are well equipped for building and repairing the boats of the fishing fleet. The building was completed in August, 1919.

Belt Railroad Office. The two-story reinforced concrete office building formerly occupied by the California Transportation Company near the foot of Washington Street was moved to the bulkhead wharf between Piers 27 and 29 and rearranged for use by the Belt Railroad. The superintendent's office, business office and record room are on the second floor, while the first floor is used for the dispatcher's office and locker rooms for the switching crews. The alterations in this building were completed in December, 1919.

Belt Railroad Oil Tank and Sand House. On account of the increased oil consumption of the Belt Railroad, as well as for the accommodation of the tugs and dredgers, it was found advisable to provide for additional oil storage. For this purpose an underground tank was constructed adjacent to the roundhouse on Seawall Lot No. 8. This tank is of reinforced concrete, 85 feet in length, 18 feet in width and 6 feet in average depth, having a capacity of 1,116 barrels of oil. Over it was built a reinforced concrete sand house for the storage and drying of locomotive sand. An engine pit was constructed alongside and a new, large-size water column erected so that the lost time of the locomotives would be reduced to a minimum by enabling them to take oil, sand and water simultaneously. A 6-inch oil pipeline was laid across the Embarcadero to the wharf between Piers 27 and 29 and is used for filling the tank from oil barges and for furnishing oil to the tugs and dredgers. The oil tank and sandhouse were completed in January, 1919.

3. OIL TERMINAL.

In order to provide facilities for the efficient and economical handling of the increasing quantities of vegetable oils which are being imported from the Orient, a fully equipped oil terminal was constructed on the property adjacent to the Islais Creek Channel and Third Street. The terminal is equipped to receive, store and reship oils arriving in cases, barrels or in bulk.

The wharf, which has a length along the channel frontage of 750 feet, was reconstructed where necessary, and cargo inclines were built to facilitate the unloading of case and barrel oil from lighters. The channel was dredged to a minimum depth of 25 feet at low tide and a minimum width of 250 feet from the Third Street bridge to deep water in the bay.

Case and Barrel Oil. The case and barrel handling section of the plant was designed with the particular idea in mind of conserving leakage. It consists of a concrete floor 180 feet by 400 feet, which is roofed over with an open shed for protection from the weather. The concrete floor was very carefully constructed so as to secure a dense, hard surface. It is laid out in eighteen sections, each sloping to a sump in the center, and by this means oil which leaks out of defective cases or barrels is reclaimed.

A can cutting and dumping machine having a capacity of 1,500 cans per hour was installed. This machine, which is motor-driven, cuts the heads of the cans, and by means of a chain conveyor slides them along a trough into which the oil drains. At the end of the trough the empty cans are collapsed and baled by hydraulic balers. Two hand dumping tables were also constructed so that different consignments of oil can be dumped at the same time. One table and the machine are equipped with steam coils for use with semi-liquid or solid oils. From the machine and the tables the oil drains to sumps, from which it is pumped by rotary pumps to storage tanks or to tank cars for shipment.

For handling barrel shipments a motor-driven coopering machine was installed and facilities were also provided for dumping oil from barrels for storage or for bulk shipment.

Bulk Oil. The bulk oil storage facilities consist of eighteen steel tanks located on land set aside for this purpose back of the oil warehouse. The following tanks have been completed and are in use:

Two, capacity 970 tons.....	1,940 tons
Four, capacity 520 tons.....	2,080 tons
Nine, capacity 280 tons.....	2,520 tons
One, capacity 75 tons.....	75 tons
Two, capacity 65 tons.....	130 tons
Total capacity	6,745 tons

The tanks are all equipped with steam coils for heating cocoanut oil and with the necessary connections to the main oil lines. They are arranged in five groups, each enclosed by a reinforced concrete wall. The storage tanks, concrete walls and all piping and pumps inside the walls were provided by five oil importing companies, which leased parcels of state-owned land for this purpose.

For handling bulk oil a complete pipe system was installed. This system includes a pipe from the wharf to the storage tanks for handling shipments direct from the steamship, a line with swinging arms for loading tank cars, with connections to the pumps delivering oil from the dumping tables and can dumping machine, and a similar line for loading cars from the storage tanks. The pipe system also includes steam and water pipes for heating the oil and for cleaning tanks, tank cars, oil pipe lines, etc.

A reinforced concrete boiler house was constructed and a boiler installed which furnishes steam for heating, cleaning and pumping.

Railroad tracks having a capacity of fourteen cars were constructed adjacent to the case and barrel warehouse and tanks for use in loading tank cars. Box cars of barrel oil are loaded on the wharf track.

Tank Barge. The tank barge "Mohican," which was purchased for use in transporting bulk oil from ship to oil terminal, was provided with the necessary additional equipment. The original tanks were enlarged so as to increase the capacity from 360 to 650 tons and steam coils were installed for heating the oil. The necessary portable pumps and oil hose were provided for use in pumping out the ship's tanks.

The oil terminal was put in service in April, 1920.

4. MAINTENANCE AND REPAIRS.

The established policy of the board, that in so far as possible all maintenance, alteration and repair work shall be done by our own organization, has been carried out during the last two years. That this policy is a wise one has, I believe, been definitely demonstrated.

The largest pieces of work undertaken were the extensive repairs to Pier 5 and the tearing out and rebuilding of the dolphin between Ferry Slips 5 and 6. Both were completed with a minimum of inconvenience to the tenants and at a reasonable cost.

Other items somewhat less extensive were the rebuilding of the track on Pier 27 as a depressed track, the tearing out and reconstructing of wharves at Fishermen's Lagoon, tearing out the old Georgia Street wharf, and building, with the salvaged materials, a bulkhead for the dredging at Islais Creek. The regular maintenance work was carried on at the same time and the piers, wharves, ferry slips, buildings and street pavement were kept in good condition.

All damages to the various structures were repaired by our organization and numerous small construction jobs were handled for the tenants of the Board. The revenue from these two sources amounted to \$103,817.21 during the last two years.

5. BELT RAILROAD.

The most important addition to the Belt Railroad was the construction, in conjunction with the Southern Pacific Company, of new interchange tracks on the property adjacent to First and Berry streets and the Embarcadero and on the Embarcadero to Brannan Street. Additional yard and team tracks were laid on and adjacent to Seawall Lots 17, 18 and 20, and several new industrial spurs were constructed. The additions to the Belt Railroad aggregated 3.45 miles in length, making the total mileage on June 30, 1920, 54.26 miles.

6. PAVING.

As in the past, the maintenance of the pavements along the waterfront has been carried on by our own organization. By the construction of several sections of bituminous pavement we have been relieved of considerable maintenance, but this has been made up by the extensive Belt Railroad construction and resurfacing in paved streets. During the last two years the contracts for paving The Embarcadero from Washington Street to Market Street and from Howard Street to Folsom Street were completed, and additional work of the same character was carried out.

Washington Street to Pacific Street. This section connects those already constructed from Washington Street south and from Pacific Street north. It consists of bituminous concrete on a 6-inch concrete base and is 915 feet in length. At either end for a total length of 415 feet it is 30 feet in width, but for the remainder of the distance where the seawall is completed the width is 65 feet. Along this portion, also, a 20-foot cement sidewalk was constructed.

Lombard Street to Bay Street. This section is 1,455 feet in length and 40 feet in width. It was laid as an 8-inch concrete pavement with a seal coat of asphalt and screenings. On account of the hardness of the asphalt used and the low temperature of the concrete when the asphalt was applied, a large part of the seal coat cracked and disintegrated. For a considerable time no attempt was made to cover the concrete and it has withstood the abrasion of the traffic remarkably well. As soon as construction joints or low spots began to appear they were covered with asphalt and screenings, and experiments were made as to the best materials to use for this purpose. That information is now available and it is the intention to cover this concrete with another seal coat during the summer. In conjunction with this pavement granite curb was set, drains and catch basins were built and a cement sidewalk 20 feet in width was constructed.

Taylor Street. As one unit in the improvement of conditions in the vicinity of Fishermen's Lagoon, Taylor Street was paved from Jefferson Street to The Embarcadero and across The Embarcadero to a point near the waterfront line. This pavement consists of a 6-inch concrete base with a 2-inch Topeka wearing surface. The necessary granite curbs, drains and catch basins were constructed as a part of this contract. The paving of Taylor Street was completed in March, 1920.

Jones and Leavenworth Streets. Two additional outlets from Fishermen's Lagoon, were secured by the construction of pavement on Jones and Leavenworth streets. The pavement on Leavenworth Street extended from the fish-packing houses already described, to Jefferson street, and at about the same time two blocks of pavement were constructed by the abutting property owners, extending to Beach and Taylor streets. These two outlets were badly needed, as they furnish connections to portions of the waterfront which were practically inaccessible.

7. ELECTRICAL.

The work of the Electrical Department during the past two years has been varied and extensive, numerous installations for light and power having been made.

Pursuant to numerous applications from operators for connections which would permit of the installation of cargo-handling equipment, a survey was made by electrical engineers representing your Board, the power companies and the manufacturers. This survey was for the purpose of studying the conditions affecting the services to be performed and of deciding upon the most advantageous system from the standpoint of electrical and mechanical efficiency. This investigation resulted in the adoption of three-phase current at a pressure of 220 volts for motive power and single phase or direct current at a pressure of 110 volts for ship lighting.

In order to permit of the use of electric elevators, pilers, stackers and conveyors on the piers and ships and also for lighting on ships, complete systems of wiring were laid out and installed on Piers 21, 25, 29, 31, 33, 41, 30, 32, 36, 38, and 40. Power receptacles are provided inside the sheds and both power and light receptacles outside the sheds for connections to the ships. The latter connections are very useful, especially in connection with ship repairs involving the use of electric welding, boring, drilling or air compressor machinery. All work was of the most modern and permanent type, with externally operated safety switches and protective power panels of latest design.

There are at present in use in connection with these installations approximately fifteen pilers and conveyors which were provided by the steamship companies in addition to two electric elevators and two stackers purchased by the Board.

The use of industrial trucks and tractors has also been encouraged and about forty are now in commission on the piers. In this connection this department has wired for seven battery charging stations at different points with a combined capacity of

more than 1,500 amperes. We have also purchased for our own use and for renting to the operators, an electric tractor, twelve trailers and two portable motor-generator sets for charging batteries.

A complete system of power wiring was installed at the vegetable oil terminal at Islais Creek for the operation of the pumps, can cutters and balers, conveyors and pilers and cooperage machine. An isolated plant of 5 kw. capacity with fifty outlets was installed on the oil barge "Mohican," with double-throw switches on the switch-board to permit of taking current from a shore line.

As in the past, all new buildings were wired for light as fast as they were completed. This involved the wiring of Piers 3, 31, 33, additions to Piers 21 and 25, bulkhead building at Fishermen's Lagoon, Belt Railroad office and oil terminal. Piers 5 and 40 were also wired for light, and Pier 3 was wired to furnish power for operating seven apron conveyors and for ship lighting, receptacles being arranged so that six steamers can receive current at one time.

The underground system was extended to take in Fishermen's Lagoon, the lighting of which is now controlled from the street circuits.

8. DREDGING.

As in the past, the Dredging Department has taken care of all regular maintenance dredging in the slips as well as several special jobs necessitated by construction work. After the removal of old Pier 1 by the Maintenance Department the entire area was gone over by the dredger and several hundred submerged pile snags were removed. The same work was done at the site of the dolphin between Slips 5 and 6 prior to the construction of the new dolphin.

The construction of Piers 31 and 33 necessitated the dredging of the entire space between them and also between Piers 29 and 31 and Piers 33 and 35. As these areas had never been dredged before, a large amount of work was necessary to put the slips in usable condition.

On account of the arrival of several large Army transports the slip adjacent to Pier 39 was dredged to a minimum depth of 40 feet at low tide. After this work was completed the "Mt. Vernon," one of the deepest draft vessels afloat, docked alongside this pier without the slightest difficulty.

Up to December 1, 1918, the dredging was carried on with one watch on Dredger No. 2 and two watches on No. 5 handled the work. On May 20, 1920, a third watch was started on No. 3, but is to be laid off after three months.

9. TESTING.

While the volume of work handled by the testing laboratory during the last two years has not been as large as formerly, the importance of the work has been no less. Careful supervision has been maintained over the cement as well as other concrete materials, structural and reinforcing steel, paints, and oils and all other structural materials. Studies were made of the destructive effect of vegetable oils on concrete and various concrete mixes and protective coatings were investigated with a view to combatting this disintegration.

As in the past, tests of various kinds have been carried on for the State Department of Engineering. The testing of cement for all State work, with the exception of the highways, has been handled by the laboratory. Concrete samples have been received and tested in connection with construction work on the Whittier School, Stockton State Hospital, San Jose Normal School, and State Building at the Civic Center in San Francisco.

10. DESIGNING AND DRAFTING.

The work of the drafting room has been carried on by a gradually decreasing number of men owing to the reduction in the construction program. At the same time we have been able to bring up to date some record work which had been previously laid aside on account of construction activities. A new map of the entire water front in two sections was completed and is included in this report. A complete set of maps of the Belt Railroad was drawn and is kept constantly up to date. In order to have a complete record of all electrical installations along the water front, a set of plats has been started covering the piers and other buildings, as well as underground work along The Embarcadero. This work is being carried on as fast as conditions will permit, and at the present time is more than one-half completed.

Numerous studies were made for the development of the Islais Creek-India Basin district and the China Basin district, with a view to having available comprehensive general plans upon which to base the design of specific units when further expansion of the harbor facilities becomes necessary.

Plans for the following work have been completed in addition to those already mentioned.

Pier 1. 597 feet in length and 138 feet in width, reinforced concrete pile construction with a timber frame and concrete shed.

Bulkhead Wharves, Pier 19 and Piers 21 to 25. 745 feet in length and 46 feet in width, reinforced concrete pile construction.

Bulkhead Wharf Building in Front of and Adjacent to Pier 5. Total length, 313 feet; southerly portion, 164 feet in length by 23 feet in width; northerly portion, 149 feet in length by 49 feet in width, timber frame construction.

Bulkhead Wharf Building in Front of Pier 27 and Between Piers 27 and 25. 318 feet in length and 70 feet in width, timber frame construction.

11. FUTURE DEVELOPMENT.

The practical completion of the improvement of the waterfront between Taylor and Channel streets necessitates the early consideration of the question of the locations to be selected for future development. For many reasons it is evident that conditions are more favorable in the territory extending from Channel street south than along the frontage west of Taylor street.

A number of studies have been made in the past showing the possibilities for the improvement of the water front between Channel street and Pier 54, and detail plans have been prepared for a reinforced concrete bulkhead wharf along this entire frontage. Consideration has been taken of the fact that Mission Rock may or may not be acquired by the State and prospective pier locations have been studied with these two alternatives in mind.

The fact that the Bethlehem Shipbuilding Corporation, the United States Steel Products Company, and the Western Sugar Refinery, all requiring access to deep water, are located between Central Basin and Islais Creek renders it inadvisable at this time to proceed with extensive improvements between these points.

There remain for consideration the tract bounded by The Embarcadero, China Basin, Third Street and Berry Street and the district bounded by India Basin, Arthur Avenue, Islais Creek and the waterfront. These two sections are mentioned together on account of their dissimilarity and because of the fact that the former is well adapted to the construction in the near future of a much needed facility, while the latter possesses almost unlimited possibilities for progressive future development.

China Basin-Berry Street Improvement. The improvements proposed at this site, as indicated by the accompanying plans, consist of a sea wall extending from Third street near the northerly end of the Channel Street bridge to The Embarcadero, adjacent to Pier 46 and along The Embarcadero to connect with the existing sea wall; the reclamation of the property inside the seawall by filling with dredged material; a reinforced concrete wharf over the outer slope of the seawall from Third street to Pier 46; a combination wharf-shed and warehouse six stories in height facing the wharf; Belt Railroad tracks on the wharf and behind the warehouse and such other tracks as may be necessary to adequately serve the property.

The wharf, as planned, will be 900 feet in length with a depth of water alongside of 34 feet at low tide. The proposed building will be 816 feet in length, 123 feet in width on the first floor, 110 feet on the second floor and 100 feet on each remaining floor. It is to be served by revolving, semi-portal electric cranes, whip hoists, elevators and other conveying equipment. The combined floor area will be 516,530 square feet. Between the building and Berry street there will be an area of 105,000 square feet of property which will be available for industrial purposes.

The improvement of this tract as outlined will provide facilities which do not now exist, namely, storage space immediately adjacent to a deep water berth, so located as to permit of direct transfer of cargo between ship and warehouse.

The estimated cost of the project as outlined is approximately \$2,300,000.

Islais Creek-India Basin Improvement. The development of this district, comprising as it does, an area of 280 acres of submerged land, constitutes a task which must of necessity extend over a long period of years. The improvement must be progressive and should proceed only as fast as may be justified by the business conditions of the port, both present and prospective.

Plans for the development of such a tract should be more or less elastic and the one submitted herewith may require modification as to details as the work progresses. It is presented as the result of the preparation and rejection of many studies and it is believed that it contains all of the elements of a properly coordinated terminals and industrial district.

The plan proposed consists of three major units with minor units and contemplates the development of the tract east of Arthur avenue and extending from the south side of India Basin as such. Each unit consists of a solid fill structure extending practically to the present water front line, with two projecting piers extending to the pierhead line. The solid fill piers as proposed are 1060 feet in width and vary in length from 1600 to 3000 feet. The piers which extend from these solid fill structures to the pierhead line are 330 feet in width and 1100 feet in length.

Along the edges of the solid fill piers are flush railroad tracks, behind which are one or two story wharf sheds. Behind the sheds are depressed tracks and beyond these are warehouses and industrial sites. Down the center is a main highway paralleled by the main railroad tracks which lead to a yard and car ferry slip at the outer end of the filled structure.

The outer piers are separated by a slip 400 feet in width, this width being adopted to permit of easy navigation by large vessels under all conditions and to afford room for the construction of a ferry slip at the inner end. Each projecting pier has a flush track adjacent to the slips and also depressed tracks in the center between the two separate pier sheds.

The main units are separated by channels 400 feet in width, this being sufficient on account of the angle at the inner end to furnish berths for large vessels. At the head of each main slip a wharfshed and warehouse are provided and the same arrangement is carried out on the south side of the improvement.

In addition to the industrial sites on each main unit, eight blocks suitable for industrial development, are created in the southerly portion of the property.

The development shown on the plan submitted will provide berths for 49 steamships, each 500 feet in length, and 6 berths for vessels 300 feet in length. The sheds are planned to be of ample width so that the cargo of each vessel can be accommodated in the space behind its own berth. The area available for warehouse and industrial sites will amount to 73 acres, all close to deep water and served by railroad tracks.

12. RECOMMENDATIONS.

In addition to the regular maintenance and repair work and small routine construction jobs with which we are continually confronted, there are several items in the program for improving the waterfront which, in my opinion, should be carried out or at least be begun during the next two years. I therefore respectfully recommend that consideration be given to the desirability of carrying forward the following work as fast as the available resources warrant:

1. *China Basin-Berry Street Improvement.* This is a type of facility not now available, but for which there is a constant demand. The complete development will extend over a considerable period of time and the preliminary work, such as wrecking the old structures and dredging the site, should be begun as soon as possible.

2. *Bulkhead Wharves, Pier 19 to Pier 25.* The existing wharves at this location are in a very unstable condition and should be replaced with reinforced concrete structures in order to avoid heavy maintenance expenses. Plans for this work have been prepared and approved.

3. *Bulkhead Building and Shed Front, Pier 5.* This building would be used by the river transportation companies, at present tenants on Pier 5 and by smaller lines operating to nearby bay and river points.

4. *Bulkhead Building and Shed Front, Pier 9.* This is a building similar to the one proposed at Pier 5, and would be used in the same way. The substructures at Pier 5 and Pier 9 are already completed.

5. *Paving.* The smooth pavement on The Embarcadero is continuous from Market street to Powell street with the exception of the portion from Pier 19 to Pier 27. South of Market street the smooth pavement extends as far as Folsom street. By paving from Pier 19 to Pier 27 and from Folsom to Harrison streets and by using the existing bulkhead wharf south of Harrison street, it would be possible to operate an auto bus line between Powell and Channel streets. As the city officials at one time agreed to operate such a bus line upon the completion of the smooth pavement and as comparatively little remains to be done, it would be advisable to complete the work in the near future.

6. *Islais Creek-India Basin Development.* The possibilities in this district are enormous and as has been said, it should be carried on progressively. The work involved in the construction of any one unit is so large and will cover such a long period of time that a start should be made in order to have available space for expansion when the need arises. The walls on each side of the first solid fill pier

should be pushed out into the bay and the space between them filled as material is available. Other features of the development could then follow in accordance with the demands of shipping and industry.

In conclusion, I desire to express my appreciation of the support accorded to me by the Board in connection with the work of the past two years and also to commend the faithful cooperation of all employees of the Department.

WATER RESOURCES.

COOPERATIVE RESEARCH.

Determining the water resources and listing them is peculiarly a governmental function.

It was not until recent years that the public awoke to the fact that vast resources of the state residing in the potential waters of its rivers, brooks and waterfalls, its lakes and glaciers were worth preserving to public use and interposed a staying hand to their spoliation for private gain by the enactment of the conservation laws of 1911.

Surface Waters.

But little had been done by public agencies in gathering data as to stream flow, and not until cooperation was established between the state and federal governments was any real progress made.

When the Department of Engineering was created in 1907 it immediately entered into cooperative arrangements with the hydrographic branch of the United States Geological Survey for the establishment of gaging stations to ascertain the quantity of water afforded throughout the year of several important streams of the state.

By 1909 seventy such stations had been established and the number was increased each year.

All persons engaged in devising projects for flood control, reclamation, irrigation, navigation and power development realize the absolute necessity for obtaining reliable information as to the flow of the streams affecting their several industries. Many private interests engaged in the development of waters gladly lend assistance in obtaining this kind of information.

By combining the funds of the state and nation and uniting with others, the field of operation has been greatly extended and continuous records covering several years are now available of the measured flow of most of the streams of the state.

When a record has been kept upon a stream of lesser importance for a period long enough to have established reliable data the station is discontinued, but each year witnesses the location of new stations so that the number is gradually increasing.

The report for 1916 showed there were then 168 stations in existence. In the biennium following 39 stations were discontinued and 49 new ones established making the number maintained up to June 30, 1918, total 179.

During the biennium just closed the work has been seriously affected by high prices for everything, so that retrenchment had to be made.

As a consequence of shortage of funds many important locations are not being measured.

The distressing shortage of water in the streams for four years, culminating in the summer just passed has demonstrated the absolute necessity for storage wherever possible.

To determine the extent that storage can be effected upon a given stream it is necessary to have accurate data of the run-off of that stream; not only the annual run-off but the fluctuating quantities from month to month and such information can only be obtained by continuous daily records extending over several years taken at every reservoir site.

It is urged that liberal appropriations should be made for this purpose.

The results of stream gaging are published by the government under the title of "Water Supply Papers."

During the period since the last report the measurements of streams has been directed by Mr. H. D. McGlashan, District Engineer, United States Geological Survey, under the supervision of Mr. N. C. Grover, Chief Hydraulic Engineer, and Mr. John C. Hoyt, Hydraulic Engineer in charge.

Their report is herewith presented:

Report to the Department of Engineering on the Progress of the Cooperative Surface Water Investigations in California by the Water Resources Branch of the United States Geological Survey for 1919-1920.

The cooperative investigation of the surface water resources of the State of California during the years 1919 and 1920 has been maintained with only slight changes from that given in your last biennial report. The temporary stations in Honey Lake and Surprise Valley drainages were discontinued September 30, 1919, and several new stations have been established in the Santa Ana drainage in southern California on account of special funds made available for this investigation.

The following table shows the river measurement stations maintained during the two-year period ending October 31, 1920. This list does not include stations maintained by private parties, for which complete records are furnished for publication in our Annual Progress Reports. The regular stations are distributed among the major drainage basins of the state as follows: Sacramento 18 per cent, San Joaquin 27 per cent, South Pacific 30 per cent, North Pacific 6 per cent, and Great Basin 19 per cent.

Stream	Location	Stream	Location
Alameda Creek*	Decoto	Bidwell Creek	At Fort Bidwell
Alameda Creek*	Niles	Bidwell Creek	Near Fort Bidwell
American River*	Fairoaks	Big Dalton Creek*	Glendora
American River, Middle Fork		Black Canyon Creek	Mesa Grande
	East Auburn	Boulder Creek	Julian
American River, North Fork	Colfax	Box Canyon Creek	Fort Bidwell
American River, South Fork	Placerville	Cache Creek	Yolo
Arroyo Seco*	Pasadena	Cajon Creek*	Keenbrook
Arroyo Seco	Soledad	Calaveras River	Jenny Lind
Baxter Creek	Lassen	Carson River, East Fork	Markleeville
Bear River	Colfax	Carson River, West Fork	Woodfords
Bear River	Van Trent	Cherry Creek*	Sequoia

*Station equipped with a water-stage recorder.

Stream	Location	Stream	Location
City Creek* -----	Highlands	Merced River, South Fork -----	Wawona
Clear Lake -----	Lakeport	Middle Eel River -----	Covelo
Cooks Lake -----	Fort Bidwell	Mill Creek* -----	Craftonville
Cosumnes River -----	Michigan Bar	Mill Creek Power Canal* -----	Craftonville
Cosumnes River, North Fork -----	El Dorado	Modesto Canal -----	La Grange
Cowhead Lake -----	Fort Bidwell	Mokelumne River -----	Clements
Coyote River -----	Coyote	Mokelumne River, Middle Fork -----	West Point
Coyote River -----	Edenvale	Mokelumne River, North Fork* -----	West Point
Coyote River -----	Madrone	Mokelumne River, South Fork -----	Railroad Flat
Cuyamaca Water Company's flume at diverting dam -----	Lakeside	Mono Lake -----	Mono Lake
Cuyamaca Water Company's flume -----	Lakeside	Monrovia Pipeline -----	Monrovia
Deep Creek -----	Adel	Oakdale Canal -----	Knights Ferry
Deep Creek above Dismal Creek -----	Fort Bidwell	Oregon Creek -----	North San Juan
Deep Creek below Dismal Creek -----	Fort Bidwell	Owens Lake -----	Big Pine
Deer Creek -----	Hot Springs	Owens River -----	Big Pine
Devil Canyon Creek* -----	San Bernardino	Owens River -----	Lone Pine
Dismal Creek -----	Warner Lake	Owens River -----	Round Valley
Eaton Creek* -----	Pasadena	Pacoima Creek* -----	San Fernando
Eel River -----	Scotia	Palermo Land and Water Com- pany's Canal -----	Enterprise
Eleanor Creek* -----	Sequoia	Pine Creek -----	Alturas
Eleanor Lake -----	Sequoia	Pine Creek -----	Round Valley
Elsinore Lake -----	Elsinore	Pit River* -----	Henderson
Falls Creek* -----	Sequoia	Pit River -----	Ydallpom
Feather River* -----	Oroville	Plunge Creek* -----	East Highlands
Feather River, Middle Fork -----	Oroville	Putah Creek -----	Winters
Feather River, Middle Fork* -----	Sloat	Rock Creek -----	Fort Bidwell
Feather River, South Fork -----	Enterprise	Rock Creek -----	Goodyear Bar
Fifteen-Mile Creek -----	Warner Lake	Rock Creek -----	Round Valley
Fish Creek* -----	Duarte	Rogers Creek* -----	Azusa
Fresno Flume and Lumber Com- pany's flume -----	Shaver	Sacramento River -----	Antler
Fresno River -----	Knowles	Sacramento River -----	Castella
Gobernador Creek -----	Carpenteria	Sacramento River* -----	Red Bluff
Goodyear Creek -----	Goodyear Bar	Salton Sea -----	Salton
Haines Creek* -----	Tujunga	San Antonio Creek* -----	Claremont
Horse Creek, North Fork -----	Fort Bidwell	San Diego River -----	Santee
Horse Fork, West Fork -----	Fort Bidwell	San Dieguito River -----	Bernardo
Indian Creek -----	Happy Camp	San Dimas Creek* -----	San Dimas
Janesville Creek -----	Lassen	San Gabriel River* -----	Azusa
Kaweah River -----	Three Rivers	San Jacinto River -----	Elsinore
Kaweah River, North Fork -----	Kaweah	San Joaquin River* -----	Friant
Kaweah River, South Fork -----	Three Rivers	San Joaquin River -----	Newman
Keeno Creek -----	Fort Bidwell	San Luis Rey River -----	Bonsall
Kern River* -----	Kernville	San Luis Rey River* -----	Mesa Grande
Kings River* -----	Sanger	San Pablo Creek -----	San Pablo
Klamath River -----	Requa	San Pablo Creek -----	Near San Pablo
Klamath River -----	Seiad Valley	Santa Ana River* -----	Mentone
Laguna Seca -----	Coyote	Santa Ana River* -----	Prado
Little Santa Anita Creek* -----	Sierra Madre	Santa Anita Creek* -----	Sierra Madre
Lone Pine Creek* -----	Keenbrook	Santa Maria Creek* -----	Ramona
Long Valley Creek -----	Doyle	Santa Ynez River -----	Lompoc
Long Valley Creek -----	Scotts	Santa Ynez River* -----	Santa Barbara
Lytle Creek* -----	Rialto	Santa Ysabel Creek* -----	Mesa Grande
Markleeville Creek -----	Markleeville	Santa Ysabel Creek* -----	Ramona
Markleeville Creek -----	Above Markleeville	Santiago Creek* -----	Villa Park
McCloud River -----	Baird	Sawpit Creek* -----	Monrovia
Meeks and Daley Canal -----	Colton	Schloss Creek -----	Lassen
Merced River -----	Exchequer	Scott River -----	Callahan
Merced River at Happy Isles* -----	Yosemite	Scott River, East Fork -----	Callahan
Merced River at Pohono Bridge* -----	Yosemite	Serrano and Carpenter Water Com- pany's Canal* -----	Villa Park
		Shasta River -----	Montague

*Station equipped with a water-stage recorder.

Stream	Location	Stream	Location
Smith River, Middle Fork	Crescent City	Tuolumne River above La Grange Dam*	La Grange
Smith River, North Fork	Crescent City	Tuolumne River at Hetch Hetchy Damsite*	Sequoia
South San Joaquin Canal	Knights Ferry	Tuolumne River, Middle Fork*	Buck Meadows
Southern California Edison Company's Canal	Azusa	Tuolumne River, South Fork*	Buck Meadows
Southern California Edison Company's Canal	Mentone	Tuolumne River, South Fork	Sequoia
Spanish Creek	Keddie	Turlock Canal	La Grange
Stanislaus River*	Knights Ferry	Twelve Mile Creek	Fort Bidwell
Stanislaus River, North Fork	Avery	Twenty Mile Creek	Fort Bidwell
Stevenson Creek*	Shaver	Utica Gold Mining Company's Canal	Avery
Strawberry Creek*	Arrowhead Springs	Warm Creek*	Colton
Susan River	Susanville	Waterman Canyon Creek*	Arrowhead Springs
Sweetwater River	Descanso	West Walker River	Coleville
Temescal Creek	Elsinore	Yosemite Creek	Yosemite
Tenaya Creek*	Yosemite	Yosemite Power Company's Canal	La Grange
Trinity River	Hoopa	Yuba River	Smartsville
Trinity River	Lewiston	Yuba River, Middle Fork	North San Juan
Tujunga Creek*	Sunland	Yuba River, North Fork	Goodyear Bar
Tulare Lake	Stratford	Yuba River, North Fork of North Fork	Downieville
Tule River	Porterville		
Tule River, South Fork	Porterville		
Tunnel Diversion	Azusa		
Tuolumne River*	Buck Meadows		
Tuolumne River at La Grange Dam	La Grange		

*Station equipped with a water-stage recorder.

A number of the above stations have been discontinued on account of lack of funds for the particular investigation, or because conditions were unfavorable for continuing the records. Nineteen of the above stations were established during the period on account of special funds made available for that work. On October 31, 1920, 155 gaging stations were in operation.

This work has been maintained in accordance with cooperative agreements with the State of California, through the Department of Engineering and the Water Commission; the city and county of San Francisco, through M. M. O'Shaughnessy, city engineer; Los Angeles county, through the board of supervisors; city of Los Angeles, through the board of public works; San Bernardino, Riverside, and Orange counties, through the boards of supervisors; United States Forest Service; United States Weather Bureau; United States Indian Service; and National Park Service. In addition, substantial assistance has been furnished by irrigation districts, private companies, and individuals.

The amount of work done and its costs, including estimated expenditures for complete records furnished free for publication, for the two-year period ending June 30, 1920 was as follows:

Drainage	Number of stations			Number of discharge measurements				Average annual cost per station including new equipment and office work
	Established	Discontinued	Maintained June 30, 1920	At regular stations	Total	Miscellaneous	Average at each station at end of year	
Sacramento ----	4	1	38	286	12	298	4	\$190 72
San Joaquin ----	2	6	48	377	33	410	4	178 70
South Pacific ----	16	5	51	1469	253	1711	17	447 24
North Pacific ----	0	1	9	28	27	55	2	171 66
Great Basin ----	0	21	17	250	318	568	4	135 46
Totals -----	22	31	163	2399	643	3042	6	\$214 76

There has been a marked change in conditions affecting this work, especially during the past year. While there has been very little increase in the regular appropriations, the cost of every item of work is much greater than before. In order that even the present amount of work be continued, increased funds are necessary. In view of the strong demand for data regarding the water resources of the state, the river measurement work should be considerably extended, and more intensive work could well be undertaken on certain important streams.

Attention is called to the low discharge of all streams in the Sacramento and San Joaquin drainages during the past three or four years. In the Sacramento River basin, the run-off for the years 1917, 1918, 1919, and 1920 has been below the mean based on the entire length of records available. The principal station on Sacramento River is located a few miles above Red Bluff. The discharge at this station for the year ending September 30, 1917 was 71 per cent of the mean computed from the complete record beginning May 1894; for 1918, 53 per cent; and for 1919, 78 per cent. The total run-off for the year ending September 30, 1920, was 41 per cent of the mean for the past 25 years. The minimum discharge for the year was 3,150 second-feet or 90 per cent of the minimum previously recorded, and the maximum discharge 35,600 second-feet or 13 per cent of the maximum recorded in 1909.

In the San Joaquin River basin, the run-off for 1917 was generally close to the normal, while 1918, 1919, and 1920 were deficient years. Kings River, which may be considered fairly representative of the important streams in this basin, has a stream flow record beginning October, 1895. The discharge of this stream, above all diversions, for 1918 was 72 per cent of the mean; for 1919, 63 per cent; and October 1919 to June, 1920, 78 per cent. With the exception of May, the run-off for each month October, 1919, to June, 1920, was less than the normal but in excess of the minimum recorded for these months.

This cycle of dry years in the Great Valley emphasizes the necessity for a rapid development of all feasible storage to meet urgent irrigation and power requirements. The present hydroelectric output during the low water season, combined with the full capacity of the steam plants, is not sufficient to meet the demands for electric power. The development of the extensive rice acreage in the Sacramento Valley and the shortage of water generally in the San Joaquin Valley, shows the necessity for increasing the supply of water available for irrigation.

It is important that a thorough study of storage possibilities throughout the State be undertaken without delay. River measurement stations, if not in operation, should be promptly established at all favorable reservoir sites, in order that the safe yield of the drainage may be determined in advance of construction.

Two years ago, at the request of San Bernardino, Riverside, and Orange counties, an intensive study was begun of the surface water supply throughout the Santa Ana Basin. This investigation will include the collection of records of flow of Santa Ana River, at strategic points, and of all important tributaries entering the basin together with the diversions for power and irrigation. There are now in operation 18 gaging stations all equipped with water-stage recorders, which give a continuous record of stage of the streams. On account of the importance of this work, a permanent type of construction was selected. The water-stage recorders are housed in reinforced concrete structures built after standard plans developed for these special conditions. The U. S. Weather Bureau has established about 40 standard precipitation stations in this region, two of which are of the self-recording type. These records will be very useful in connection with studies of run-off conditions. The Survey expects soon to be able to detail a geologist, who will make a comprehensive study of the ground water in this basin.

The maintenance of the Santa Ana stations is financed by special appropriations made by San Bernardino, Riverside, and Orange counties. Substantial cooperation is also furnished by the Forest Service and Weather Bureau. The construction cost of a number of these stations was paid from a special appropriation of \$5000 made by the last legislature and disbursed by the State Water Commission.

This investigation is on the same basis as the one maintained in Los Angeles county during the past five years, where 17 gaging stations and 48 standard Weather Bureau precipitation stations are in operation.

The following Surface Water-Supply Papers, containing California records, have been published since November 1918:

Paper 410, Annual Progress Report of Great Basin for the year ending September 30, 1915.

Paper 411, Annual Progress Report of California for the year ending September 30, 1915.

Paper 440, Annual Progress Report of Great Basin for the year ending September, 30, 1916.

Paper 441, Annual Progress Report of California for the year ending September 30, 1916.

Water-Supply Papers 460 and 461 for 1917, and 480 for 1918, are at the Government Printing Office. Nearly all records for the year ending September 30, 1919, have been compiled and the results are available to the public. They will be published in Water-Supply Papers 510 and 511. In addition to these regular annual reports, Water-Supply Paper 447, Surface Water Supply of the Pacific Slope of Southern California, which contains all stream flow records collected in Southern California to September 30, 1918, will soon be available for distribution.

In the administration of the work of the Water Resources Branch of the Geological Survey, the district office is maintained at 328 Custom House, San Francisco. A sub-office is retained at 602 Federal Building, Los Angeles, for the convenience of southern California and as a headquarters for work in the South Pacific drainage. Records of stream flow for all sections of the United States and data collected by other branches of the Survey may be consulted at either office.

The water resources investigation in California is under the general supervision of Mr. N. C. Grover, Chief Hydraulic Engineer, and Mr. John C. Hoyt, Hydraulic Engineer in charge of surface waters for the Geological Survey.

Underground Waters.

In many localities where the surface waters are absent or not under sufficient control, or are not conserved so as to be adequate for irrigation or for city domestic supply there are underground waters which may be, and frequently are, obtained either supplemental to the surface supply or in lieu thereof if the latter be wanting.

Considerable areas have been brought under cultivation by means of wells equipped with modern pumping plants, and many towns and cities are dependent upon the same method for their supplies.

The experience in many of the areas where wells have been used for some time is that as the number of wells increase the water table gradually sinks, compelling a lowering of the pumps and a consequent increase in the "lift" to raise the water to the surface. In some instances the supply has proved inadequate to satisfy the demands and other sources had to be sought.

A line of investigation being pursued now in some localities is to ascertain the relation existing between the amount of water available from the soils and the annual replacement that may reasonably be expected.

This relationship having been found will enable a definite limit to be set beyond which water may not be withdrawn without endangering the permanency of the supply.

A preliminary report on the ground water condition in Sacramento Valley by Kirk Bryan, which was published a few years ago, will soon be followed by a complete report upon the subject by the same author. It will enable more reliable estimates to be made upon the water resources of the valley.

Reports upon the ground waters of several other areas which have been delayed by post war conditions are in preparation and will soon add materially to public information on the subject.

The investigation of underground waters is being prosecuted in cooperation between the United States and the State of California by the same agencies employed in measuring surface waters.

Mr. O. E. Meinzer, Geologist U. S. Geological Survey, is in charge under the direction of the hydrographic branch and his report of operations during the past two years is herewith presented.

Report to the Department of Engineering on the progress of the ground-water investigations in California by the Water Resources Branch of the United States Geological Survey for 1919-1920, by O. E. Meinzer, Geologist in charge, Division of Ground Waters.

During the latter part of the war, the regular investigations of ground water in California were suspended, but considerable important work was done in the state to assist the War and Navy departments of the federal government in developing the largely increased water supplies that were needed. Since the close of the war a special effort has been made to complete the several large investigations that had been interrupted, and to publish the resulting reports. Hence, not much new field work was undertaken during the biennial period.

Four reports on ground water in California were published as water-supply papers during the period, as follows:

Water-Supply Paper 429, Ground Water in the San Jacinto and Temecula basins, Calif., by G. A. Waring. 1919. 113 pp., 14 pls.

Water-Supply Paper 446, Geology and ground waters of the western part of San Diego County, Calif., by A. J. Ellis and C. H. Lee. 1919. 321 pp., 47 pls.

Water-Supply Paper 450-b, Ground water in Lanfair Valley, Calif., by D. G. Thompson, pp. 29-50, pls. v-vi.

Water-Supply Paper 450-c, Ground water in Pahump, Mesquite, and Ivanpah valleys, Nev. and Calif., by G. A. Waring, pp. 51-86, pls. vii-xi.

Three reports were sent to the Government Printing Office to be published as water-supply papers, but were not yet in print at the close of the biennial period. These are as follows:

Water-Supply Paper 490-a. Routes to desert watering places in the Salton Sea region, Calif., by John S. Brown. This desert guidebook was issued later in 1920. It contains concise but specific directions for finding practically all watering places in a desert area of 10,000 square miles, together with large relief maps on which the watering places and connecting roads are shown. 86 pp., 7 pls., and 2 figs.

Water-Supply Paper 490-b. Routes to desert watering places in the Mohave region, by D. G. Thompson. This is a desert guide similar to W. 490-a. It covers, in like detail, an area of about 20,000 square miles in San Bernardino and adjacent counties.

Water-Supply Paper 468. Records of water levels in wells in southern California, by F. C. Ebert. Many of these records have been published in different reports, but the present volume will bring together all the records, including the unpublished data obtained in recent years.

Two additional reports were completed and transmitted to the Director of the United States Geological Survey. They will be sent to the Government Printing Office in the near future to be published as water-supply papers. These reports are as follows:

Water-Supply Paper 495. Geology and ground water in Sacramento Valley, Calif., by Kirk Bryan. A preliminary report on Sacramento Valley by Kirk Bryan has already been published as Water-Supply Paper 375-a.

The Salton Sea region, Calif.—A geographic, geologic, and hydrologic reconnaissance, by John S. Brown. This paper covers the same region as is covered by W. 490-a. It will be a large volume, full of new information of much scientific and practical value.

A report on ground water in Santa Clara Valley, by W. O. Clark, was completed by the author and will also be published as a water-supply paper. This report is

based on a large amount of data on fluctuations of the water table, seepage losses of streams, withdrawals by pumping, and character and specific yield of the water-bearing materials. It attempts to use these data in making estimates of the quantities of ground water that are annually available in different parts of the valley. Preliminary reports on parts of the valley are already in print as Water-Supply Paper 345-h, and Water-Supply Paper 400-e.

Considerable data have been obtained by W. O. Clark on ground-water conditions in Salinas and Napa valleys, but these investigations are not completed.

In the fall of 1919, D. G. Thompson spent several months in field work in the Mohave region to supplement the work done in that region in 1917 and 1918. He is preparing two reports on the region—one on the Antelope Valley, giving recent ground-water developments and making estimates of the available annual supply of ground water; the other a general report on the geography, geology, and hydrology of the entire Mohave region of about 20,000 square miles.

The latest ground-water investigation to be undertaken in the state is an intensive quantitative study in the Santa Ana drainage basin. This is in charge of D. G. Thompson, geologist, who is cooperating with F. C. Ebert, hydraulic engineer. Mr. Ebert is in charge of stream gaging in the region and he is making numerous measurements of water levels in wells and of seepage losses of influent streams, preliminary to the ground-water studies which Mr. Thompson is to take up actively as soon as he has completed his report on the Mohave region.

TOPOGRAPHIC SURVEYS.

NOTE.—This topic is included in the discussions of hydro-economics for the reason that the contour topographic maps are necessary in the study and solution of nearly all water problems.

The cooperative agreement between the Department of Engineering and the Director of the United States Geological Survey for a topographic survey of the state has been continued during the past biennium, as in previous years.

During this period nearly 1700 square miles of territory were surveyed and mapped, about 75 per cent being in the San Joaquin Valley. The remainder was mostly in the coast counties where it was desirable to hasten the survey in the interests of the War Department.

The survey in the San Joaquin Valley has reached beyond Kings River and is being extended down the valley as rapidly as the resources will permit.

The maps resulting from these surveys are immensely helpful to the agents of the Department and all others engaged in studies for irrigation development.

The work is being conducted under supervision of George R. Davis, Geographer, in charge of the Pacific Division, directed by Colonel R. B. Marshall, Chief Geographer, and C. H. Birdseye, Chief Topographic Engineer, United States Geological Survey, whose report in detail here follows:

Report of topographic surveys in cooperation between the United States Geological Survey and the State of California for the fiscal years beginning July 1, 1918, and ending June 30, 1920.

In accordance with the cooperative agreements signed July, 1918, and August, 1919, by George Otis Smith, Director, for the United States Geological Survey, and by W. F. McClure, State Engineer, for the State of California, the federal survey allotted \$14,000 each year and the state an equal amount for cooperative topographic

surveys in the State of California for the fiscal years ending June 30, 1919, and June 30, 1920. In addition to the regular cooperative allotments by the State of California, an additional state allotment of \$7,500 was made to meet former overdrafts in allotments by the Geological Survey.

The following is a summary of the field and office work accomplished during the above periods under the general direction of R. B. Marshall, Chief Geographer, and C. H. Birdseye, Chief Topographic Engineer, and under the immediate supervision of George R. Davis, Geographer, in charge of the Pacific Division.

FIELD WORK.

Quadrangles	Counties	Publication scale	Area Mapped square miles	Primary levels		Sec'dy traverse Miles	Triangulation	
				Miles	Bench marks		Station occupied	Station marked
Academy -----	Fresno	1:31,680	60	12	2	-----	-----	-----
Arbourns -----	Madera	1:31,680	-----	10	1	-----	2	1
	Merced							
Bonita Ranch -----	San Benito	-----	-----	-----	-----	-----	-----	-----
Bridge -----	Madera	1:31,680	60	4	-----	229	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Burrel -----	Madera	1:31,680	60	9	-----	175	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Carrisalito Springs	Kings	1:31,680	-----	8	2	-----	-----	-----
	Merced	-----	-----	-----	-----	-----	-----	-----
Caruthers -----	Fresno	1:31,680	60	52	8	108	2	2
	Fresno	-----	-----	-----	-----	-----	-----	-----
Chaney Ranch -----	Fresno	1:31,680	-----	8	2	-----	-----	-----
Charleston School	Fresno	1:31,680	23	6	-----	-----	2	-----
	Merced	-----	-----	-----	-----	-----	-----	-----
Cierva Hills -----	Fresno	1:31,680	60	38	6	147	1	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Clovis -----	Fresno	1:31,680	-----	14	2	-----	-----	2
	Fresno	-----	-----	-----	-----	-----	-----	-----
Conejos -----	Fresno	1:31,680	-----	10	2	-----	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Dos Palos -----	Madera	1:31,680	60	20	6	100	-----	-----
	Merced	-----	-----	-----	-----	-----	-----	-----
Fresno -----	Fresno	1:31,680	-----	8	2	-----	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Friant -----	Madera	1:31,680	60	20	4	308	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Firebaugh -----	Madera	1:31,680	-----	9	5	-----	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
Gregg -----	Fresno	1:31,680	60	8	2	323	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
Helm -----	Fresno	1:31,680	-----	14	3	-----	-----	2
	Madera	-----	-----	-----	-----	-----	-----	-----
Herndon -----	Fresno	1:31,680	-----	18	3	-----	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
Jamison -----	Fresno	1:31,680	-----	19	4	-----	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
Kearney Park -----	Fresno	1:31,680	-----	26	7	-----	-----	-----
Kentucky Well -----	Madera	1:31,680	60	-----	-----	147	-----	-----
Kerman -----	Fresno	1:31,680	-----	22	7	-----	-----	1
	Fresno	-----	-----	-----	-----	-----	-----	-----
Kings River -----	Fresno	1:31,680	4	10	2	-----	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Laguna Seco Ranch	Fresno	1:31,680	19	36	2	-----	-----	-----
	Merced	-----	-----	-----	-----	-----	-----	-----
Laton -----	Fresno	1:31,680	-----	8	2	-----	-----	-----
	Kings	-----	-----	-----	-----	-----	-----	-----
Madera -----	Madera	1:31,680	60	10	2	210	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
Malaga -----	Fresno	1:31,680	-----	9	3	-----	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
Mendota -----	Fresno	1:31,680	60	10	3	-----	1	2
	Madera	-----	-----	-----	-----	-----	-----	-----
Monocline Ridge	Fresno	1:31,680	-----	-----	-----	-----	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
No. 18 -----	Fresno	1:31,680	-----	-----	-----	-----	-----	-----
No. 19 -----	Fresno	1:31,680	-----	19	4	-----	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
No. 20 -----	Fresno	1:31,680	-----	10	4	-----	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
No. 21 -----	Fresno	1:31,680	-----	8	1	-----	-----	-----
	Madera	-----	-----	-----	-----	-----	-----	-----
No. 22 -----	Fresno	1:31,680	7	12	3	-----	-----	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
No. 23 -----	Fresno	1:31,680	23	6	2	-----	1	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
No. 24 -----	Fresno	1:31,680	-----	19	5	-----	-----	3
	Fresno	-----	-----	-----	-----	-----	-----	-----
No. 25 -----	Fresno	1:31,680	-----	7	2	-----	1	-----
	Fresno	-----	-----	-----	-----	-----	-----	-----
No. 26 -----	Fresno	1:31,680	-----	12	4	-----	-----	2
	Fresno	-----	-----	-----	-----	-----	-----	-----
No. 27 -----	Tulare	1:31,680	-----	3	1	-----	-----	-----

FIELD WORK (Continued.)

Quadrangles	Counties	Publication scale	Area Mapped square miles	Primary levels		Sec'dy traverse miles	Triangulation	
				Miles	Bench marks		Station occupied	Station marked
No. 28-----	Fresno	1:31,680	-----	-----	-----	-----	-----	2
No. 29-----	Fresno	1:31,680	-----	-----	-----	-----	-----	2
No. 31-----	Fresno	1:31,680	-----	-----	-----	-----	-----	2
No. 32-----	Fresno	1:31,680	-----	-----	-----	-----	-----	2
Oil City-----	Fresno	1:31,680	-----	-----	-----	-----	-----	4
Ora-----	Fresno	1:31,680	-----	-----	-----	-----	-----	1
Oxalls-----	{ Fresno	1:31,680	60	18	6	-----	-----	-----
	{ Madera							
Pozo Farm-----	{ Merced	1:31,680	60	6	2	-----	-----	-----
	{ Fresno							
Raisin-----	Madera	1:31,680	-----	11	2	-----	-----	-----
Reedley Special-----	{ Fresno	1:31,680	-----	25	6	-----	-----	-----
	{ Tulare							
Riverdale-----	{ Fresno	1:31,680	-----	8	2	-----	-----	-----
	{ Kings							
Sanger-----	Fresno	1:31,680	-----	16	3	-----	-----	-----
San Joaquin-----	Fresno	1:31,680	-----	18	6	-----	-----	1
Selma-----	{ Fresno	1:31,680	-----	25	6	-----	-----	-----
	{ Kings							
Sheep Ranch-----	Fresno	1:31,680	60	9	3	-----	-----	-----
Squaw Valley-----	{ Fresno	1:31,680	-----	4	1	-----	-----	-----
	{ Tulare							
Sultana-----	Fresno	1:31,680	-----	25	6	-----	-----	-----
Tranquillity-----	Tulare	1:31,680	-----	23	6	-----	-----	1
Tumey Hills-----	{ Fresno	1:31,680	-----	13	-----	-----	3	1
	{ San Benito							
Wahotoke-----	Fresno	1:31,680	-----	9	3	-----	-----	2
Wheatville-----	Fresno	1:31,680	-----	-----	-----	-----	-----	-----
			693	749	167	1,807	13	33

During the fiscal year 1919 the funds allotted by the State of California for co-operative topographic surveys were used entirely on areas selected for military mapping by the War Department. The following is a statement of progress during the year:

Avenal-----	{ San Luis Obispo	1:62,500	-----	35	10	-----	2	4
	{ Santa Barbara							
Carbona-----	{ San Joaquin	1:62,500	116	33	6	-----	-----	-----
	{ Stanislaus							
Hollister-----	{ Monterey	1:62,500	27	-----	-----	-----	-----	-----
	{ San Benito							
La Panza-----	{ Santa Clara	1:62,500	-----	-----	-----	-----	3	6
	{ Kern							
Mt. Boardman-----	{ San Luis Obispo	1:62,500	141	32	6	-----	-----	-----
	{ Santa Clara							
Nipomo-----	Stanislaus	1:62,500	222	63	17	314	2	3
Pozo-----	San Luis Obispo	1:62,500	162	10	9	318	3	3
Trimmer-----	San Luis Obispo	1:96,000	110	-----	-----	8	-----	-----
			780	173	43	640	10	16

Additional progress was made on some of these quadrangles during the fiscal year 1920, the expense of which was paid entirely from Geological Survey funds.

OFFICE WORK.

The office drafting of the Adelaida, Bonanza, Bonita Ranch, Bradley, Bridge, Bryson, Carbona, Carrisalito Springs, Charleston School, Crevison Peak, Daulton, Dos Palos, Friant, Gilroy Hot Springs, Gonzales, Gregg, Kentucky Well, King City, Juniperro Serra, Las Garzas Creek, Lucia, Madera, Metz, Nipomo, Orestimba, Oxalis, Paso Robles, Point Sur, Poza, Poza Farm, San Benito, San Luis Creek, Volta, and San Simeon topographic maps was completed and the maps transmitted for engraving.

Progress in the drafting of additional sheets was made as follows: Elgin, 85 per cent; Gonzales, 15 per cent; Hollister, 95 per cent; Jamesburg, 85 per cent; Los Banos, 90 per cent; Mount Boardman, 45 per cent; Santa Rita Bridge, 90 per cent; Trimmer, 81 per cent.

Primary level circuits were adjusted for the following quadrangles: Adelaida, Cayucos, Gorda, Lucia, Madera, Mount Boardman, Mojave, Piedras Blancas, San Luis Obispo, San Simeon, and Tracy.

Geographic positions were computed for the following quadrangles: Academy, Adelaida, Arenal, Berenda, Bonanza, Bradley, Bryson, Bridge, Clovis, Carrisalito Springs, Charleston School, Daulton, Dos Palos, Fresno, Friant, Gonzales, Gustine, Helm, Herndon, Hollister, Ingomar, Jamison, Juniperro Serra, Jamesburg, Kearney Park, Kerman, King City, Kings River, La Panza, Los Banos, Madera, Malaga, Metz, Nos. 8, 10, 16, 17, 19, 20, 21, 22, 23, 24, Nipomo, Ortigalito, Paso Robles, Panoche, Pozo, Point Sur, Reedley, Salinas Valley, San Benito, Sandy Mush, San Joaquin, Sanger, San Luis Ranch, San Miguel, San Simeon, Selma, Sharon, Sheep Ranch, Squaw Valley, Sultana, Tranquility, Volta, and Wahtoke.

IRRIGATION INVESTIGATIONS.

For several years a cooperative arrangement has existed between the United States government and the state whereby investigation is conducted in the many phases of irrigation.

This cooperation is effected in California by the Irrigation Division of the Bureau of Public Roads, United States Department of Agriculture, and the State Department of Engineering.

There is also an arrangement whereby these two agencies have the cooperation of the College of Agriculture of the State University, and this tripartite body, acting collectively or individually, enjoys cooperative relations with the State Water Commission, and with city, county and corporate organizations and individuals in acquiring data relating to irrigation matters and cognate subjects.

The subjects which have been investigated include:

The quantity of water required for different crops under different conditions.

The effects of over-irrigation upon crops and incidentally upon revenue from the crops.

The best methods of applying water for different crops and different conditions of soil.

In connection with the last subject particular attention has been given to the manufacture of cement pipe for conveying and distributing water with the result that many manufacturers are now putting out a product of a quality undreamed of a few years ago. As a result of the experiments concrete pipes are now on the market which have

stood tests of 288 pounds to the square inch and with a minimum of "sweating." Manufacturers readily agree to specifications for pipe not reinforced calling for a tensile strength of 200 pounds per square inch for all sizes up to 16 inches diameter equivalent to the following heads:

8 inch -----	145 feet;
12 inch -----	115 feet;
16 inch -----	108 feet.

In the investigations into the duty of water it has been demonstrated that for the conditions of soil and climate of Sacramento Valley, $2\frac{1}{2}$ to 3 acre-feet of water applied is the limit of profitable irrigation for alfalfa, and for rice approximately 5 acre-feet properly applied produces better returns than seven or more used without due care in selection of soils and the best practice.

Some crops are found to respond more generously where the quota of water is applied in smaller amounts at more frequent intervals than has been the practice.

This information will be of great assistance in planning distribution conduits for irrigation systems.

Many years study have led to the conclusion that it is usually unprofitable in years of normal rainfall to irrigate barley unless the water is very cheap.

Some irrigation waters are so heavily laden with silt that the cleaning of ditches becomes a heavy burden. Studies are in progress to determine some way of obviating a part at least of this outlay.

A progress report by Dr. Samuel Fortier, Chief of the Irrigation Division, United States Department of Agriculture, of the cooperative work above outlined is herewith presented.

COOPERATIVE IRRIGATION INVESTIGATIONS.

A Progress Report to the Department of Engineering for the Years 1918 to 1920.

By SAMUEL FORTIER, Chief Irrigation Division U. S. Department of Agriculture.

INTRODUCTION.

Fully thirty per cent of the members of the Irrigation Division of the Bureau of Public Roads, participated in the war and the season of 1919 was well advanced before some of these could resume their former duties. This reduction in the force together with the performance of many special tasks resulting from the war interfered to some extent with the cooperative work as outlined for the first half of the biennial period. On the other hand, with the headquarters of the Division in Berkeley, California, it has been possible to detail men not members of the California cooperative force for work in this State for short periods of time. The services thus rendered have more than made up for any lack of service due to war activities.

The lines of investigations mentioned in previous reports of this character have been followed during the past two years in conjunction with the same cooperative agencies. The departures from regular schedules have been due to urgent requests for assistance along special lines which have accordingly received more than their share of attention. Of these, assistance rendered to communities contemplating the formation of irrigation districts has required the largest expenditure of time and

money. Mr. Frank Adams has taken a leading part in this work and measured by the benefits which are likely to result, he could not have devoted his energies to a better cause. The services which Mr. Adams has rendered to land owners within organized or proposed irrigation districts have been duplicated in a way by Mr. C. E. Tait whose work has been more largely confined to mutual water companies and similar organizations of which several hundred are in existence in Southern California.

Making field and laboratory tests of concrete pipe and concrete pipe materials has also been stressed with creditable results under the direct management of M. B. Williams, F. W. Stanley and E. C. Fortier. The practical results secured led to the active cooperation in this investigation of the California Association of Concrete Pipe Manufacturers which comprise to date about 40 plants in widely separated parts of the state.

These and other phases of the State cooperative work together with brief references to results obtained are reviewed in what follows.

IRRIGATION CONDITIONS IN CALIFORNIA.

In considering the future growth of California two factors seem to surpass all others in importance. These are the conservation of the water supply and its most serviceable use for all purposes. The chief purposes for which water is required embrace the domestic needs of citizens and their livestock, whether as individual family units or as aggregations of such in towns and cities, the irrigation of land, power for domestic and industrial uses, the navigation of streams and mining. It goes without saying that man and the domestic animals under his care and protection must have water to drink regardless of its scarcity, but as relatively little is needed for this purpose, it will never make any serious draft on the total available supply. The next most important use is to obtain water for the growing of foodstuffs for man and animals and since the future requirements for this purpose are more than double the quantity of water available it is incumbent upon the state to do everything in its power to utilize the land and water resources in such a way as eventually to lead to the greatest production of food and clothing. The agricultural conditions of the state in reference to these two main resources, viz: land and water, may be summed up in a few words. Nearly two-thirds of the total land area is rocky, rough and untillable and excepting small areas will never yield anything but small revenues as pasture for domestic animals. Of the remainder, about 14,000,000 acres are covered with commercial timber leaving a balance of about 22,000,000 acres of arable and irrigable land of which less than one-half is ever likely to be irrigated on account of the scarcity of water. It is thus seen that only about 10 per cent of the land area of California can ever be used for intensive farming under irrigation.

No accurate determination has ever been made of the power which can be created from the streams of the state when a part of the flood flow is retained in reservoirs. The estimates vary all the way from 5 to 10 million horsepower and these have been made without due regard to the needs of irrigation or to the extent to which the use of water for irrigation will encroach upon that for power.

So far, individuals, power companies, irrigation districts and other organizations making use of water have been left fairly free to help themselves as they saw fit in tapping public streams and utilizing public waters. In the early stages of development water was so abundant and cheap that rigid control on the part of the state was not warranted and might have retarded rather than advanced progress. We can now look back upon seventy years of this kind of untrammelled effort during which marvelous achievements have been accomplished by individuals and organized groups of individuals with little or no assistance from either the State or the Nation. About 40 per cent of the arable land for which water can be had has been reclaimed and put under more or less intensive farming and nearly 20 per cent of the power latent in streams has been developed. It would be desirable, in many ways, if this kind of development could continue until all the water is utilized for one purpose or another. It is, however, easy to show that such a course is not practical and even if it were that it would not be to the best interests of all Californians. The truth of the matter is that the relatively easy tasks in the utilization of the land and water resources have been done; the difficult yet remain. The people of California are now confronted with water problems extremely difficult of solution and upon the right solution of these depend in a large measure the future growth and prosperity of the state.

As previously stated, the easy things have been done, the summer flow of streams has been appropriated and used for irrigation and power and only the flood flow and the underground supplies remain. The greater part of the annual flood flow still passes uncontrolled and unutilized to the ocean and of the 12 to 15 million acre-feet for which nature has provided storage sites less than one-third is being made to serve a useful purpose. The magnitude and cost of the works necessary to hold back that part of the flood waters subject to control is very great and it is doubtful if the means and methods employed in the past will suffice.

Besides, the natural water supply is not evenly distributed over the state. There is an excess in some parts and a deficiency in others and few surveys have been made to determine the feasibility of transferring the excess found in one place to other localities, where it will serve a more useful purpose. It is quite evident that individuals, companies and communities are powerless to settle questions of this kind. Neither can they be expected to consider as paramount the public welfare when such a policy would injuriously affect their own interests. Furthermore, it is not reasonable to expect that the promoters acting independently will modify their plans to benefit a rival water user or go out of their way to consider the most serviceable use of water supply from the standpoint of the public.

In addition to the furnishing of water for irrigation and power, there are large areas of land of high potentiality to be protected from floods, other extensive areas requiring drainage, river channels to be improved for navigation and an adequate supply of potable water conveyed to cities. It is thus apparent that the welfare of California, both for the present and the future, demands the most complete conservation and equitable distribution of public waters as well as protection from excess waters wherever found.

In respect to the water resources of California and the benefits to be derived from their best use a lesson may be learned from that cradle of irrigation, Mesopotamia. The lower portion of the Mesopotamia plain known as Babylonia resembles in many ways the central plain of California. This is true in regard to water supply, climate, extent of arable land and the crops that can be grown. The Tigris river is larger than the Sacramento river during its low-water stages and carries as much water in high floods. As a result of winter rains and the melting of the snow in spring on the Armenian mountains, high floods are the rule rather than the exception and these being much too large for the stream bed to carry, overtop the banks and inundate millions of acres of arable land. The Euphrates river may also be compared in volume with the San Joaquin river, but like it, its flood flow is more easily controlled. The Babylonian delta contains more arable land than is to be found in the central plain of California, the approximate figures being 12,000,000 acres for the former and 10,000,000 acres for the latter. In both there is a long dry summer followed by a short rainy winter with maximum temperatures in summer reaching to 120 degrees Fahrenheit and falling to 20 degrees above zero in winter. While the precipitation on the mountains and high table lands approaches that on the Sierras the annual rainfall of the valley is somewhat less than that of the San Joaquin Valley. These striking resemblances in everything essential to irrigation farming tend to produce the same wide diversity of crops, which range from the hardy cereals such as wheat and barley through the intermediate crops of beans, corn, alfalfa, cotton and deciduous fruits to the semi-tropical products of oranges and dates. California has passed through but two dynasties; the plains of Shinar has been under the sway of a large number of rulers in its time. Persians, Assyrians, Greeks, Romans, Arabians, Turks and the Allies have each played a leading part in the destiny of this country. In the development of the new, is it not possible to be guided somewhat by the experience of the old, gained through centuries of toilsome endeavor? Apart from the destructiveness of wars and the advantages of a stable government, the long record of Babylonian history shows the need of the conservation, control and skillful use of the available water supply. When a part of the surplus waters of the Tigris and Euphrates rivers were stored in reservoirs, when the irrigated lands were protected by heavy levees and when the entire plain was a network of canals and drains, as was the case in the days of Nebuchadnezzar and later under the rule of Alexander the Great, the country prospered, but whenever the power emanating from a central government relaxed or became impotent, the irrigation works so vital to the welfare of the inhabitants could not be maintained and once fertile lands reverted to barren deserts or unhealthy marshes.

The water situation in California has reached a stage which calls for a larger measure of control on the part of the state. The exercise of authority delegated to power corporations and irrigation districts, if longer continued without adequate

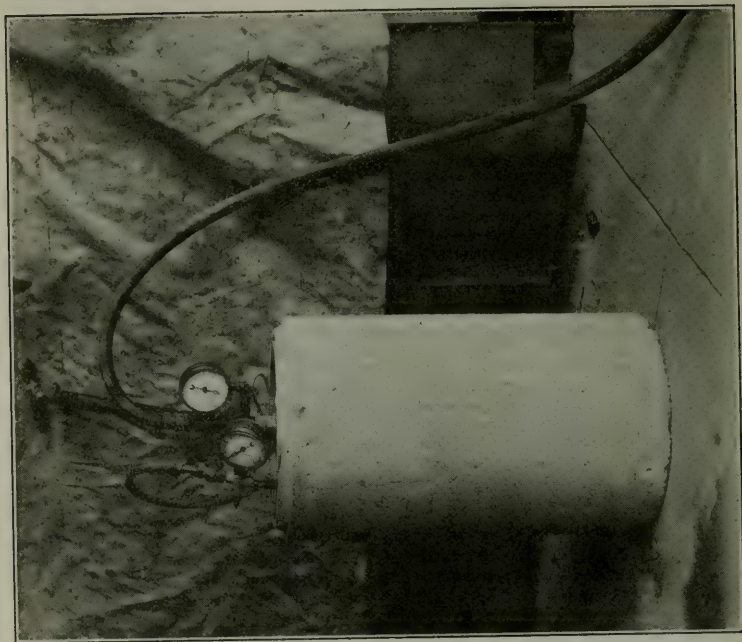


PLATE VIII. B. Concrete Pipe Testing Apparatus in Place.

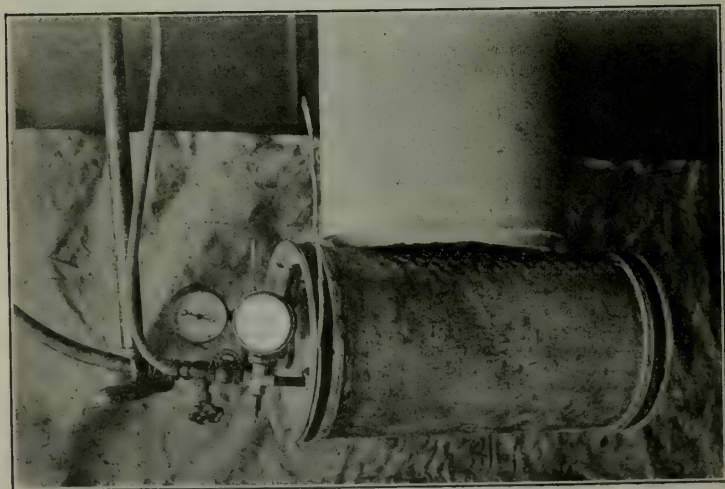


PLATE VIII. A. Concrete Pipe Testing Apparatus. Removed From Test Section.

state control, is certain to result in a partial and incomplete utilization of the water supply for the reason that private interests will seek to benefit themselves even though it be done at the expense of the public in general. Then too, as water becomes more scarce and of higher value, controversies are certain to arise over its appropriation, diversion and use, ending in costly and profitless litigation.

In recent years, there has arisen a sentiment in favor of the state helping to finance the larger and more costly community enterprises, more particularly the building of dams for the storage of water. Since this sentiment is rapidly growing in favor, it may be regarded as practically settled that the state in the near future will either lend its credit or furnish the funds needed for such undertakings. However, before the state government commits itself to a policy of this kind, it would seem highly desirable to obtain more complete and accurate data in regard to the water resources and the best means of utilizing them. The collection and compilation of such data would render possible in time the making of a comprehensive plan of water utilization for the various uses. In formulating a plan of this kind the welfare of the state, rather than that of private interests, would be duly considered. There is an urgent need for reliable information concerning the capacities of reservoir sites and the character of the material underlying the sites of dams together with estimates of cost and where the stored water could be best used.

Preliminary surveys are also needed in connection with underground water sources and the drainage of waterlogged lands.

Such an investigation ought to include the feasibility and desirability of transferring water from one watershed to another, the use of water first for power and afterwards for irrigation, the protection of lands subject to overflow, the most economical means of pumping water and the relationship between irrigation and navigation. These more or less technical studies of an engineering character could be supplemented by others pertaining more directly to finance, organization and management.

In a word, the State Department of Engineering should be provided by the legislature with sufficient funds during the next four years to enable it to investigate, with or without the cooperation of the Federal Government, the water resources of the state and their utilization with a view to the preparation of a comprehensive plan to serve as a guide for further development.

CONCRETE PIPE FOR IRRIGATION.

In the report submitted to the Department of Engineering two years ago, a brief reference is made to concrete pipe investigations. This cooperative undertaking was begun in March, 1917, but owing to the war, little progress was made until after our engineers were released from war activities. Early in the spring of 1919, the work was resumed in earnest and has since progressed in a highly satisfactory manner.

The purpose of the investigation is two-fold. One is to encourage the more general use of pipes for irrigation systems in order to lessen the loss of water occurring in earthen channels, and the other to improve the quality of concrete pipe. Little need be stated in regard to the first-named purpose since it is well known that earthen ditches and canals usually waste a large percentage of the water carried, through absorption and percolation. The need of improving the quality of concrete pipe is not so well known or understood. This industry, like many others of its kind, has been evolved from small beginnings in a relatively short time and although the annual output is now large, little was done prior to the beginning of the co-operative investigations to improve and standardize methods of manufacture or to provide reliable information upon which engineers and others might base conclusions. Until recently pipe was made in much the same way as butter and cheese were made a generation or more ago. Every farm on which cows were kept was a butter and cheese factory on a small scale. The resultant products were anything but uniform in quality. Some was excellent and others unfit for use, with no end of intermediate grades between these two extremes.

So with the making of concrete pipe. The maker who selected good materials, proportioned them properly and exercised care and good judgment in the moulding, turned out a good product, which is performing excellent service after 20 and 30 years of continuous use. On the contrary, the man who picked up materials that were the most accessible, including a generous amount of barnyard scrapings, and formed them into a pipe without regard to strength or efficiency, made a poor pipe, which soon failed as a result of defects, and these failures have injuriously affected the

entire industry. One still encounters in this state prominent hydraulic engineers whose knowledge of concrete pipe seems to be confined to barn yard plants and who are unwilling to risk their reputations in recommending that such pipe, when unreinforced, be laid under pressures exceeding fifteen feet head.

The investigation as first outlined, embraced the following, to which other features have since been added.

1. Effect of quality of aggregates.
2. Effect of grading materials on strength and imperviousness.
3. Effect of quantity of water used in the mixture.
4. Effect of rock dust and other fine material on density and water tightness.
5. Effect of tamping.
6. Effect of curing.
7. Comparison of strength of specimens tested dry and saturated.

Although concrete has been extensively studied for a score or more of years, very little of the results of these studies have any application to concrete pipe. One of the essential qualities of this kind of pipe is its high tensile strength, yet few reliable tests have ever been made of concrete in tension. Imperviousness is another essential quality and although numerous dams and retaining walls have been built, these were so massive in design as to preclude a comparison with the shells of piping ranging from 1 to 2 inches in thickness. Accordingly, in designing the necessary apparatus and devising ways and means of conducting the various tests, little assistance could be secured from the labors of others. The method first adopted of testing the tensile strength of pipe followed the customary practice and consisted in laying five joints of pipe on the surface of the ground, bulkheading the ends and keeping the whole in place by a connecting rod. This method, however, proved to be costly and cumbersome and involved the disposal of a large amount of waste water. In developing a better plan, M. B. Williams, F. W. Stanley and E. C. Fortier, who were conducting the investigations, sought to design apparatus that would test each joint separately without the use of bulkheads and without subjecting the pipe under test to any forces other than the pressure within its shell. This effort resulted in the making of a tester of galvanized sheet metal, cylindrical in form and about the length of a joint of pipe. In diameter, the cylinder was about 2 inches less than the pipe to be tested. Metal grooves in the form of the letter "U" encircled each end of the cylinder and into these rubber tubing of the proper size was inserted. In testing a joint of pipe, the cylinder is first placed within the pipe, water under pressure is then turned into the rubber tubes to make water-tight connections, and finally water under gradually increasing pressure is turned into the annular space surrounding the shell until rupture occurs. It was later found that aluminum on account of its light weight was preferable to steel in making the cylinders and in the latest experiments, testers made of the former have been used. Four sets of testing apparatus are in use at present, designed to test 8-inch, 10-inch, 12-inch and 18-inch pipe respectively.

It was also found necessary to devise apparatus for laboratory use. One of these was a machine to make concrete rings for testing purposes of a given diameter, 6 inches high and having a shell 1 inch thick. This machine had a solid tamper which compressed the top surface of the entire ring of fresh concrete with each stroke and by equalizing the vertical distance through which the tamper fell and counting the strokes the pressure exerted could be regulated and its intensity measured. These specimen rings, it was thought, would be similar in many respects to concrete pipe and afford an easy and cheap way of testing the effect of different ingredients and the proportions of each, including the water content as well as the effect of light and heavy tamping.

The testing machine designed to break the specimen rings consisted of a rubber bag which fitted snugly within the ring, the open ends being bulkheaded by means of clamps holding concrete plates. Water is forced into the bag slowly at first in order to let the confined air escape, after which a gradually increasing pressure is applied until rupture occurs. This apparatus has worked well and the results derived have been more uniform than might be expected. This is in a measure due to the fact that the water pressure within the rubber bag and against the bulkheads keeps the latter free from the shell of the ring. Six-inch rings, 28 days old, have withstood an internal pressure of 230 pounds per square inch, or an equivalent tensile strength in the shell of 600 pounds per square inch. These specimens were made of the best known available material, properly graded and having proportions of about one of cement to three of the aggregates.

A part of a ring which has been tested and ruptured is used to determine its porosity. This specimen is clamped to concrete blocks having the proper concave and convex surfaces and rendered water-tight by rubber disks. Water pressure of varying intensity up to 100 pounds per square inch is then applied and the amount of sweating and in porous specimens the amount of percolation is recorded.

Laboratory and field tests have been carried on, as far as practical, simultaneously and the results of both are in close accord due mainly to the fact that chief consideration has always been given to keeping all phases of the investigation wholly within practical lines and in close accordance with customary practice in pipe making. The limited space of this article will not permit a detailed description of these tests, which are still in progress (November 15, 1920).

Briefly stated, 100 six-inch specimen rings have been made, cured and tested and over 200 field and yard tests of manufactured pipe have been made. The materials used in the laboratory tests have been shipped from representative localities over the entire state and each of 50 pipe yards have furnished pipe for testing purposes. The general conclusions which may be drawn from the work thus far performed may be summarized as follows:

1. A high grade pipe can be made of either gravel or crushed rock providing they are of good quality, well graded and contain no soft material.

2. The addition of a certain amount of rock dust not exceeding 20 per cent by volume, does not reduce the strength, and increases the density and imperviousness. A small admixture of clay when dry, well pulverized and free from organic matter, produces like results.

3. Other conditions being similar, the heavier the tamping, the greater the strength.

4. A lightly tamped pipe, if tested when saturated, will be found about 30 per cent weaker than if tested when dry.

5. A heavily tamped pipe, if tested when saturated, will show a decrease in strength of from 1 to 10 per cent from that shown when it is tested dry.

6. Pipe made with a dry mixture similar to that used in small hand-tamped plants, seeps badly in spite of proper grading, but can be made both strong and impervious by especially heavy tamping.

7. In general, hand-made pipe of a dry mixture seeps badly and has a low tensile strength, but these defects can be largely overcome by the use of a wet mixture.

8. Other conditions being similar, machine-made pipe, in small and medium sizes, is superior in all essential qualities to hand-made pipe. This applies to tamping and trowelling machines alike.

9. Newly made pipe should be thoroughly cured by continuous sprinkling if exposed to the sun for 6 to 8 days in summer and for a longer period in winter, or by periodic sprinkling for the same length of time when kept under roof.

10. The results of 93 field and yard tests of single joints of machine-made pipe showed an average tensile strength in the shell of 288 pounds per square inch. The results of 8 tests of pipe made with air-tamping machines, 204 pounds, those of 19 hand-tamped pipe made from a wet mixture, 168 pounds, and 39 tests of hand-tamped pipe made from a dry mixture, an average tensile strength of 130 pounds per square inch.

11. When the pipe was laid and the joints cemented in sets of 5 joints, the following average results were obtained: Eighteen tests of machine-made pipe, 259 pounds per square inch. Two tests of hand-tamped pipe made from a wet mixture, 165 pounds, and three tests of hand-made pipe from a dry mixture showed an average tensile strength of 82 pounds per square inch.

The relatively high tensile strength, as demonstrated by actual tests, of the greater part of the concrete pipe made in California, has led to the adoption by the California Association of Concrete Pipe Manufacturers of a tentative specification which requires, in addition to other stipulations, a tensile strength of 200 pounds per square inch in the shell, of pipe 16 inches or less in diameter, when tested to failure by internal water pressure. It will be noted that this requirement, applicable to all standard pipe 16 inches or less in diameter made hereafter by the members of this Association, is equivalent to a head of 145 feet on an 8-inch pipe, to a head of 115 feet on a 12-inch pipe and to a head of 108 feet on a 16-inch pipe.

During the past two years, investigations of concrete pipe from the purchaser's and user's standpoint, have likewise been made by F. W. Stanley, Senior Irrigation Engineer of this Division, and a bulletin is now being printed by the Government on "The Use of Concrete Pipe in Irrigation."



PLATE IX. Overflow and stand-pipe system Blanchard lemon orchard, Santa Paula, California.

The main purpose of this publication is to furnish irrigation farmers and orchardists with reliable information concerning this type of pipe, and with such practical suggestions regarding making and laying as may enable those engaged in this work to avoid the usual mistakes and improve the present practice.

In much of the work done and the results secured, the members of this Division have had the whole-hearted cooperation and support of the California Association of Concrete Pipe Manufacturers and a large number of pipe makers within the state who are not members of this organization. The officers of the Association and managers of plants have not hesitated to tell what they knew about their business and to suggest proper lines of investigation. Without the valuable assistance rendered by these practical men, much less would have been accomplished. Furthermore, a large amount of financial assistance has been given of late by the Association. Last spring, when the cooperative funds for this work were about exhausted, the Association agreed to pay the salary and expenses of F. W. Stanley on the condition that he would continue the investigations under way and also act as its representative. This was done, and since April 11, 1920, Mr. Stanley has had all his expenses paid by the Association, except during a short period spent in writing a report on the results of concrete pipe tests. Prior to that date, Messrs. M. B. Williams and E. C. Fortier, the other members of the force, had been loaned to the state to assist the Land Settlement Board to make and install about 125 miles of concrete pipe for the Delhi Colony, so that for several months this Division has been obliged, for lack of funds, to confine its efforts mainly to the preparation of reports for publication on this subject. It is hoped, however, that Congress will grant for the next fiscal year, a larger appropriation for this and other similar work, so that it can be carried to completion.

COOPERATION WITH UNIVERSITY OF CALIFORNIA.

Under the terms of the cooperation agreement between the Irrigation Division, Bureau of Public Roads, and the Department of Engineering, provision is made for participation by the College of Agriculture of the University of California. While this is but continuing a relationship that has existed throughout the period of our work in California, the College of Agriculture now maintains a separate Division of Irrigation Investigations. Although, strictly speaking, this separate Division conducts certain investigations that are not directly part of our California cooperative work, still the close relationship that exists between the two staffs of workers and the joint contribution to salaries or maintenance, or both, make the results of both Divisions available alike to all parties. Mr. Frank Adams, who is in charge of the College of Agriculture Division of Irrigation Investigations, also continues in direct charge of the general work of our Division in northern and central California. The principal activities conducted under his supervision during the biennium have been as follows:

Revision of Irrigation Map of California.

The map, published in 1912 in cooperation with the State Conservation Commission, has served a very valuable purpose in acquainting the people of the State with the location and extent of the agricultural and the irrigated areas of California. The revision has involved a complete re-cavass of the State, the field platting of irrigated areas, some revision of the boundaries of agricultural areas, and the complete revision and redrawing of the base map on the previous scale of four miles to the inch. While it is the intention to reprint the map on the former scale of eight miles to the inch, blue line prints of the base map on which the outlines of irrigated and agricultural areas will be shown, will be available in part or complete, at cost of blue-printing, to any who may desire them. In the work of revising this map, Mr. Fred C. Scobey has been directly responsible for the redrawing and Mr. Wells A. Hutchins for the field platting. The new map will be ready for publication during the present winter. One thousand dollars has been contributed to the expense of this work by the State Water Commission.

Orchard Irrigation.

The need has long been felt for more information regarding orchard irrigation. Enough information has been gathered to indicate in a general way that both deciduous and citrus orchards can be successfully grown in California when given from one to two acre-feet of irrigation water per acre per year depending upon location and rainfall. This, however, is meager information when one considers the importance of the fruit industry in California. Because of the more pressing need

for other information and the smallness of the funds available, research in this field has had to be delayed, but now the increased allotments to its Division of Irrigation Investigations by the College of Agriculture has permitted that Division to make a definite beginning and a contribution has been given to the work from our cooperative fund. However, due to the attention being given by the Citrus Experiment Station of the College of Agriculture at Riverside to problems connected with the irrigation of citrus fruits and walnuts, the present orchard work under the supervision of Mr. Adams is being confined mainly to deciduous orchards. Working on a small experimental Muir peach orchard and a portion of an old almond orchard at Davis, on six commercial orchards in Santa Clara Valley, and with tanks, an endeavor is being made to ascertain not merely how much irrigation water orchards need in a season, but what effect different soil moisture conditions have on orchards at different seasonal periods such as the time of blossoming, of principal wood growth in the spring, of ripening fruit, and of storing up strength for setting of fruit buds. Involved in this study are such matters as the depth of rooting of trees, the wilting point, the field moisture capacity of orchard soils, physical methods of applying water so that it will be generally equalized through the rooting zone, value of cultivation in soil moisture conservation in orchards, and the relation of irrigation to diseases and abnormalities of deciduous trees. Owing to the brief period this work has been in progress, those in charge do not feel justified in undertaking yet to draw any definite conclusions.

Professor F. J. Veihmeyer of the College of Agriculture is devoting most of his time to this field and his headquarters have recently been moved to Mountain View where he will be in closer touch and really be a part of the Deciduous Fruit Experiment Station of the University of California established by the last legislature.

According to Professor Veihmeyer in 1919 the fruit growers produced fruit valued at \$234,613,000, and of this total approximately \$159,000,000 was returned to the deciduous growers in California. The bulk of the deciduous fruit shipments go from north of the Tehachapi. Since climatic conditions here are not so well suited for citrus as for deciduous orchards, as irrigation resources are developed there will be a corresponding increase in the deciduous fruit industry, and since a very large majority of the areas ultimately possible of irrigation lie in northern and central California, it is reasonable to assume that there will be proportionately greater increase of return from deciduous orchards over that received from citrus groves.

The several extremely dry seasons which the state has just experienced have stimulated interest in irrigation. This awakened interest is especially evidenced by deciduous fruit growers. This is probably due to the fact that a considerable portion of deciduous orchards has been planted in localities where dependence is placed upon the rainfall, and the deficiency of rainfall has materially affected the yields in such localities. This in turn has brought home the fact that irrigation is necessary in practically every section of California for the most successful production of horticultural crops. The expansion of the area planted to these crops can be brought about only by irrigation. While the effort in those orchard sections which heretofore have been unirrigated is, of course, first to develop sources of irrigation they, as well as those localities in which irrigation has been practiced for some time, are seeking information as to the soil moisture requirements for deciduous fruit at definite periods in the seasonal growth of the trees.

This demand for exact information may be due to the mounting costs of water for irrigation, which is especially true in those localities where water for irrigation is obtained from underground sources. But the desire for betterment of practice is not wholly one of economy in the use of water. Competition also demands a better product and maximum yield.

In one of the principal fruit sections of the state, the need for irrigation has become so well recognized, and this increased demand, resulting in a lowering of the underground water level, has so increased the cost that as much as \$100 an acre-foot has been the charge for water. Orchardists have installed wells and pumping equipment under conditions entailing capital charges exceeding \$500 per acre in certain exceptional circumstances. In the Santa Clara Valley during the present season one ten-acre orchard produced six tons of dry prunes of excellent quality per acre, and this tremendous yield was only made possible by irrigation. The trees could never have carried the extremely heavy load of fruit to maturity without ample moisture in the soil.

Irrigation of deciduous fruit trees, unlike citrus, which are continuous growers, is not merely a question of maintaining a constantly moist soil condition. The physiological processes of deciduous fruit trees are such that undoubtedly there

are definite periods in which results might be influenced if favorable or unfavorable conditions were maintained. Of all the factors which influence plant growth, soil moisture condition is most completely under control. It is thought, then, that probably irrigation is the most important means of regulating plant growth in such a way as to produce profitable results. If it be proven that deciduous orchards require irrigation at definite times throughout the season, the effect of such demand might be the deciding factor in the planning and construction of irrigation systems. This would be especially true if it is contemplated to irrigate areas largely planted to deciduous fruit.

The results obtained during 1919 upon the small experimental orchards at the University Farm at Davis and the six commercial orchards in the Santa Clara Valley have not been so marked. While the maximum returns were secured on the orchard in the Santa Clara Valley which received the greatest amount of water and which was irrigated the greatest number of times, the success of those orchards which received no water during the summer months, and with dry soil to a depth of six feet throughout this time, cannot be explained. This same lack of response to irrigation was also the result at Davis with the experimental Muir peach orchard. It may be that the effect of irrigation is not so immediate as has been supposed, and, due to the influence of other factors, such results might not be apparent for several subsequent seasons. This argues for experiments extending over a considerable period before definite conclusions can be drawn.

The depths of principal rooting of deciduous fruit trees are not well known, but the best information obtainable indicates that the majority of the feeding roots are within the first six feet of soil. It has been assumed in the orchard irrigation experiments that at least this depth of soil must be wetted to be most effective.

It was found early in the course of these experiments that the attempt to bring the soil for any considerable depth to any moisture content less than the full field capacity of the soil was a failure. The distribution of moisture by capillarity was so slow in any direction that it was not effective in equalizing the moisture content. In other words, in order to wet the lower soil strata, it was necessary to bring those above to their full capacity before any appreciable movement resulted. In a practical way the so-called optimum moisture condition is the full field capacity. In the various irrigation treatments in the orchards at Davis, sufficient water at each irrigation was applied to each plot to bring the soil to a depth of six feet up to its full field capacity.

Rice Irrigation.

Bulletin 325 of the College of Agriculture entitled "Rice Irrigation Measurements and Experiments in Sacramento Valley, 1914-19," published in September, 1920, summarizes work under this heading begun as a part of our California cooperative work when rice growing became established as a commercial industry in this State, and conducted through 1919 when it was temporarily discontinued through lack of funds. This work had previously been partially summarized by College of Agriculture Bulletin No. 279 entitled "Irrigation of Rice in California" published in May, 1917, and also in reports of the State Department of Engineering and the State Water Commission. In the conduct of these studies, the State Water Commission and the Cereal Investigations of the Bureau of Plant Industry, U. S. Department of Agriculture, have made important contributions. The aim has been, first, to determine the seasonal water requirements of rice, and, second, the best methods to follow in rice irrigation practice. Conclusions regarding the seasonal water requirements of rice are that on those soils of Sacramento Valley best suited to this crop, namely, well drained clays and clay adobes, generally impervious to deep percolation of water, five acre-feet per acre per annum is sufficient, and that water costs on the pervious loam soils or the shallow clay soils not underlain by an impervious stratum, will be too large to justify the growth of this crop under a normal price for rice. While the studies of the best irrigation practice are quite conclusive in some particulars, they indicate the need for further careful research. The more important conclusions thus far drawn as to irrigation practice are (a) that especially on new soil, the desirable depth of submergence approximates six inches; (b) that on lands generally free from alkali the largest yields generally follow beginning submergence about 30 days after the plants appear and that on the "goose lands," which contain considerable quantities of alkali, beginning submergence earlier is desirable; (c) that keeping rice fields only moist or "muddy" throughout the growing season gives reduced yields of poor quality; (d) that

fluctuating depths of submergence may prove beneficial in rice irrigation but experiments to date have not fully demonstrated this for California conditions; and (e) that it is imperative that ground water and rise of alkali be controlled in California rice fields both by confining rice growing to the heavier impervious clays and clay adobes, and by thorough and adequate drainage facilities embracing entire areas affected or likely to be affected.

Alfalfa Irrigation.

Important studies on duty of water for alfalfa conducted at Davis from 1910 to 1915, which showed 2.5 to 3 acre-feet per acre per annum as the most satisfactory seasonal duty for Sacramento Valley conditions, have not been continued at Davis, although a repetition of these studies is contemplated for San Joaquin Valley somewhere south of Turlock. However, using an annual depth of 2.5 acre-feet per acre per annum as a base, Professor S. H. Beckett of the College of Agriculture has been varying the amounts and number of individual irrigations from twelve 2.5 inch irrigations to two irrigations of 15 inches each per season. The results summarized below indicate that the larger yields were obtained with the larger number of light irrigations rather than with the smaller number of heavy irrigations.

Summary of Yields of Alfalfa With Seasonal Application of 2.5 Acre-Feet of Water per Acre per Annum but with Different Number and Amounts of Individual Irrigations.

Number of irrigations	Depth of each irrigation, inches	Yield in tons per acre			
		1918	1919	1920	Average
12 -----	2.50	10.20	11.06	9.30	10.18
8 -----	3.75	8.90	11.16	8.07	9.37
6 -----	5.00	8.55	10.85	7.48	8.96
4 -----	7.50	7.28	10.09	6.88*	8.68
3 -----	10.00	7.18	10.00	8.30	8.69
2 -----	15.00	7.85	9.66	8.35	8.62

*Owing to small irrigating head available land surface not fully covered, with resulting lower yield. This year not included in average.

Grain Irrigation.

Reports have frequently been made of grain irrigation experiments conducted by Professor S. H. Beckett at Davis. These are still being conducted on a somewhat reduced scale. Nine years' study have indicated that in years of normal or greater rainfall evenly distributed, large returns can not be expected from grain irrigation in Sacramento Valley except where irrigation water is cheap. In fact, in years of heavy rainfall in Sacramento Valley, the application of additional water to grain is likely to be clearly unprofitable, particularly if the irrigation water is applied during the wet spring months. In years of normal rainfall, however, the benefit is very clear and is probably greatest when the land is irrigated in the fall prior to seeding—the practice which has been universally found to be best in connection with the growing of grain under irrigation in the southern half of the San Joaquin Valley. For instance, citing only the season of 1920, which, of course, was a very dry year, he obtained the following yields in pounds of grain per acre: With irrigating land in September prior to seeding, 1322; with summer irrigation immediately after cutting and followed by cultivation during the summer and fall, 1702; with no irrigation, 202.

A feature of the grain irrigation studies at Davis that has developed in a very interesting way has been the effect on the physical condition of the soil where follow crops have been planted after the grain harvest and no organic matter returned to the soil. For instance, certain plats at Davis used during a ten-year period for grain and follow crops and likewise certain plats used under crop rotation schedules with such crops as grain, sugar beets, potatoes, and corn, are now showing such a poor physical condition that even under most careful irrigation treatment it has been difficult to make even the fine soils on the Davis farm take water readily. In fact, on certain plats it has not been possible during the entire

season of 1920 to obtain a satisfactory stand of alfalfa because the irrigation water could not be made to penetrate the soil sufficiently to keep the young alfalfa plants adequately nourished. Certain experiments have been made in subsoiling these plats to get irrigation water under the compact surface and plough sole with very satisfactory results. The general conclusion to be drawn is that neither crop rotation nor grain growing with a follow crop should be continually practiced.

Use of Water on Kings River.

This was a full season's study of use of water under all canals diverting water from Kings River made during the season of 1918 by Mr. Harry Barnes and published in 1920 as Bulletin No. 7 of the Department of Engineering entitled "Use of Water from Kings River, California, 1918."

Miscellaneous Work.

Much time has been given to general public service work in irrigation, such as assistance to the Department of Engineering and Farm Bureaus and communities in matters relating to the organization or operation of irrigation districts, this assistance having been extended to thirty-five proposed or organized projects during the past two years. The most important of these included studies and reports such as Mr. A. L. Fellows' report on the Kern County Irrigation Possibilities and the Ground Waters of the Western Part of Madera County; Mr. A. T. Mitchelson's study and report on the Extension of the Irrigated Area in the Vicinity of Placerville; Mr. Frank Adams' and Mr. Mitchelson's report on the Proposed Yuba-Honcut Irrigation District; Mr. F. C. Scobey's study and report on Irrigation as an Insurance Against Drought for California Stockmen, and Mr. W. W. McLaughlin's report on the Proposed McArthur Irrigation Project in Shasta County.

In addition, assistance has been given to individuals in planning irrigation systems and matters of irrigation practice; participation in the Emergency Water Conference organized in connection with the drought condition during 1920; and assistance to the Convent of the Sacred Heart at Menlo Park in planning and developing an irrigation system.

PROGRESS OF IRRIGATION IN SOUTHERN CALIFORNIA.

(Based on work done under the direct supervision of C. E. Tait, Senior Irrigation Engineer.)

Irrigation development in southern California continues and outside of the Colorado River valleys the chief additions to the area irrigated are under numerous comparatively small undertakings which taken collectively constitute material increases. Ever since the dry period of 20 years ago the idea has prevailed with many that the limit of the water supply has been reached. This is true as regards the summer stream flow and the underground waters of some of the larger valleys, but large areas in all of the counties of the coastal drainage region except Orange, may yet be reclaimed by the storage of flood waters, and smaller areas may be reclaimed in some localities by the further development of underground waters. The time is being reached when greater expense can be incurred and less favorable reservoir sites can be utilized for a number of reasons; first the value of irrigation water has increased; second the electrical power that may be developed coincident with storage now has a certain market; and third the stream regulation that would result from storage is a need that the public is already beginning to pay for. Suitable reservoir sites are to be found on many of the streams.

The spreading of flood waters over the gravel cones of the streams for underground storage is very beneficial and is being more extensively practised. The economical methods of developing, distributing and using water in southern California have made it possible for the irrigators to pass through dry years without detriment.

The southern part of the state relying to such a great extent on the better regulated underground waters has been discommoded less during 1920 by deficiency of water supply than many sections of northern California where the streams so much more directly responsive to precipitation are the main dependence.

It seems inadvisable to encourage further underground water development in some of the valleys such as Pomona Valley, where already 20,000 acres is irrigated with surface storage from the stream and underground waters of a watershed of only 36 square miles. In at least one locality, Perris Valley, unquestionably an overdraft has been made on the underground supply.

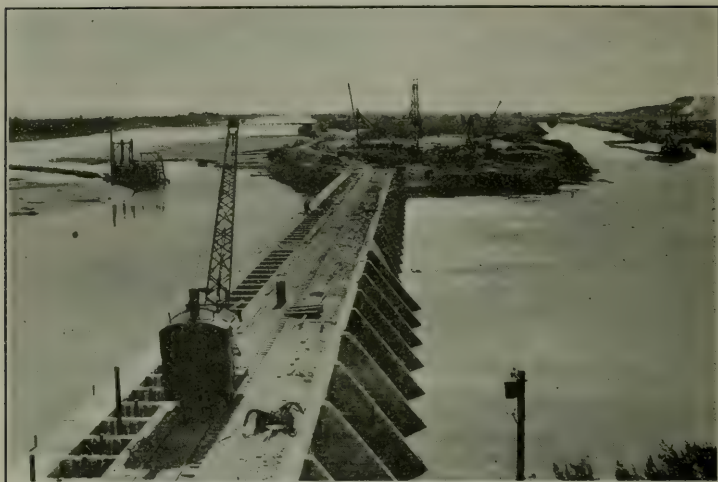


PLATE X. A. Rockwood Diversion Dam on Colorado River in Head of Imperial Canal (Imperial Valley, California).

Notice suction dredgers in river and canal constantly employed in removing silt.

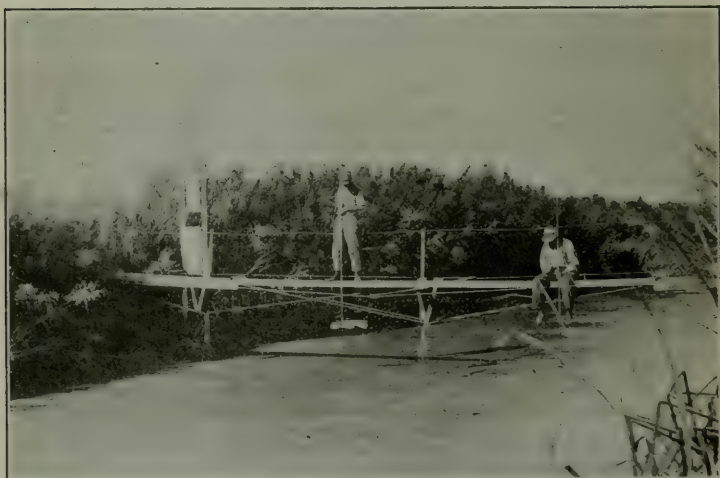


PLATE X. B. Sampling silt and measuring velocity in an Imperial Valley canal. (Silt determinations Imperial Valley, California.)

The U. S. Census Bureau has released preliminary figures subject to correction giving the area irrigated in southern California counties in 1919 which together with the results of previous census give the following:

County	Acres irrigated	Acres irrigated	Acres irrigated	Increase 1899 to 1909		Increase 1909 to 1919	
	1899	1909	1919	Acres	Per cent	Acres	Per cent
Santa Barbara -----	3,218	12,012	10,947	8,794	273.3	1,065	8.9
Ventura -----	11,935	25,273	31,592	13,388	111.8	6,319	25.0
Los Angeles -----	85,644	145,586	247,223	59,942	70.0	101,637	69.8
San Bernardino -----	37,177	70,278	107,363	33,101	85.5	37,085	52.8
Riverside -----	32,947	71,436	101,944	38,489	116.8	30,508	42.7
Orange -----	41,549	55,056	86,060	13,507	32.5	31,004	56.3
San Diego -----	16,022	24,944	24,799	8,922	55.7	145	0.5
Imperial -----		190,711	402,671	190,711		211,960	111.1
Inyo -----	41,026	65,163	71,611	24,173	58.8	6,448	1.0
	263,518	660,450	1,084,210	390,977	145.1	423,751	64.2

The greatest increase of the last decade has been in Imperial Valley. The water companies of Imperial Valley give figures showing that about 425,000 acres received water at some season during 1919 and it is probable that the lower figures obtained by the census show only the area irrigated at one certain season of the year. The Imperial Irrigation District states that about 190,000 acres is irrigated from the Imperial Canal in Mexico, in addition to the area irrigated in the United States, therefore the Imperial Canal is supplying water to 600,000 acres approximately.

The Government has completed surveys for the trunk of an all-American canal to lead from Laguna dam on Colorado River to Imperial Valley which may be constructed by Imperial Irrigation District and which would make the district independent of Mexico and improve the water service for the lands in the United States. If the Government appropriates funds and carries out the plan for storage of the flood waters of the Colorado the all-American canal may also be used to supply water for the irrigation of the mesa lands east of Imperial Valley and other lands bordering Salton Sea. The Government lands on the mesa are withdrawn from entry and should they be reclaimed the applications of soldiers for them would be given preference. It is also probable that a large unit of these lands would be colonized under the State Land Settlement Board of California.

Other substantial increases in areas irrigated have occurred in Los Angeles, San Bernardino, Riverside and Orange counties. The increase in Los Angeles is due largely to the use of aqueduct water in San Fernando Valley and the principal increase in Riverside has been in Palo Verde Valley. In San Bernardino the increase has been much distributed but includes material additions at Fontana and Yucaipa. In Orange many new citrus fruit orchards have been planted in the La Habra section and some of the coast lands have been reclaimed by the combined effects of drainage and irrigation.

Ventura and Inyo show only small increases, while San Diego and Santa Barbara show slight decreases, which results, however, are believed to be due to the different methods of the agents taking the census in 1909 and 1919 rather than to an actual decrease. Especially in San Diego County it is certain that small additions have been made, as on San Dieguito River and at Oceanside, and if these have been more than compensated for by reductions it is probably the result of the floods of 1916.

SILT PROBLEMS ON COLORADO RIVER.

The investigation of the silt problems on the lower part of the Colorado River and the canals leading from the river outlined in the last biennial report has been completed and the report is being prepared. This work was conducted under a joint working agreement with Imperial Irrigation District, which appropriated \$4,755 for the expense of J. E. Peck, its engineer designated to conduct the investigation. The joint arrangement has resulted in much benefit to both parties by enabling a broader scope to be covered and in avoiding duplication of effort. Although the work progressed under a common outline and has had a common purpose, each

party has used its funds, and has been responsible for, certain phases of the work, the district using its funds on work entirely related to its own irrigation system and this department extending its own activities to the Yuma and Palo Verde irrigation system and to Colorado River. The purpose has been to determine the amount and character of silt carried at different seasons of the year in the river, and the canal systems, the distribution of silt deposit in the Imperial Valley system, velocities that transport the different grades of silt and to obtain data to enable the better design and maintenance of work such as channels, intakes, sluice gates and settling basins. The cost of cleaning canals in Imperial Valley alone is over \$500,000 per annum. The all-American canal for Imperial Valley for which the preliminary work is being done is estimated by the U. S. Reclamation Service to cost \$31,000,000 and the proposed Greater Colorado River storage, reclamation, power and river regulation project is estimated to cost \$100,000,000. If there is any problem in the economic and engineering feasibility of these great undertakings for which there has been no satisfactory solution it is the proper handling of the silt. Although the present investigation may not directly solve the problem it is hoped that the results will be found to fill the need for basic data for further studies and that they will contribute toward an ultimate solution of the most troublesome matter.

Samples of water to determine the distribution and disposal of the silt in the Imperial canal system were taken daily from July 1, 1917 to June 30, 1918 at 18 stations throughout the canal system, each station being located where the water was sufficiently turbulent to mix the solid matter carried in suspension. The percentages of silt were determined on the basis of the weight of the original sample of muddy water by filtering out and weighing the solid matter. As the results of this part of the investigation consist of 6570 different percentages only a summary is here given. The percentages obtained from the Hanlon station at the intake of the main canal represent the amount of silt entering the canal system from Colorado River. The following table gives the maximum, minimum and average daily percentages by weight for each month of the period covered:

	Minimum	Maximum	Average
1917—July .....	.063	.750	.232
August .....	.174	1.033	.574
September .....	.074	.516	.145
October .....	.129	.990	.371
November .....	.060	.249	.111
December .....	.064	.159	.080
1918—January .....	.050	.217	.088
February .....	.036	.219	.083
March .....	.121	1.309	.609
April .....	.103	.540	.286
May .....	.140	.322	.263
June .....	.019	.269	.061

It will be noted from the foregoing that the smallest percentage of silt is for June, the month in which occurs each year the peak of the annual flood resulting from the melting of the snows in the upper watersheds of the Colorado, also that the maximum is for August, the month that brings the erratic floods in the lower tributaries of the river draining the lower areas of that region of the southwest visited by late summer rains.

The percentages obtained from the 17 other stations located on the system below the Hanlon station show amounts varying both above and below those for Hanlon and in general they show no appreciable reduction thereby indicating that while great volumes of silt are removed from the canals by mechanical means each year the amount deposited in the canals is a very small proportion of the total amount at the intake and that most of the silt entering the canals passes on to the lands irrigated. Frequently a lower station shows an increase in percentage over an upper station indicating scouring instead of deposition, the influence of dredging or possibly, that diversions to laterals take the more nearly clear water at the top of the trunk canal leaving undiverted the more heavily silt laden water at the bottom.

Since the completion of the sampling to determine the distribution of silt in the Imperial canal system attention has been given to the distribution of silt throughout

the cross sections of channels and the carrying power of different velocities of current. The work on this part of the investigation has been conducted on the canals of Imperial, Yuma and Palo Verde valleys and on the Colorado River. The tests have covered a wide range as regards size, slope, proportions, mean velocity, and silt-load of stream. It was soon found that there was very little if any difference in the amount of silt at different points along any horizontal in the cross section of a channel and that the amount carried in the higher velocities at the middle of the stream were not appreciably greater than that in the slower velocities near the banks at the same elevation. But distribution of the silt in any vertical of a stream was found to be quite uneven, and all of the later tests were confined to obtaining more data on the vertical distribution.

In these tests the velocity curve for any vertical was obtained in the usual manner by the use of the current meter and by plating so that the velocity could be read for any point in the vertical. Simultaneous with metering the velocity the water was sampled at various points in the same vertical by an instrument specially devised for taking samples at any depth. The percentage of silt by weight was determined by filtering and weighing in the laboratory so that the results permitted the plating of a curve of distribution of silt in the vertical. By the use of screens ranging from 20 to 280 meshes per inch the silt was graded as regards fineness and curves showing the vertical distribution for each grade in addition to the curve for the total silt were plotted.

The curves show that the percentage of all material in suspension increases from top to bottom, also that the coarser the particles the greater the proportion toward the bottom of the channel and the finer the more equal the distribution in the vertical. Specific gravity of the silt material influences its distribution as well as degree of fineness but variation in specific gravity was found to be small. In most ordinary canal velocities material coarse enough to be retained on a screen of 80 meshes per inch was confined to approximately the lower tenth of the depth of water while that fine enough to pass a screen of 150 meshes per inch would in small percentages reach to the surface of the water. By far the greater part of the total silt in suspension in the Colorado and the irrigation canals is fine material that passes the 280 mesh per inch screen, which is the finest screen obtainable. This is therefore finer than Portland cement which passes the 200 mesh screen. This material passing the finest screen was in all cases found to be equally distributed throughout the vertical for all velocities under which tests were made including mean velocities of less than one-half foot per second in small ditches. In other words, any velocity that is practical for an irrigation canal will carry in suspension the greater part of the silt transported by the waters of Colorado River. The silts of the Colorado appear to be comparable in degree of fineness to those of the Nile but they are much finer than those of the rivers of India where the British engineers have made the investigations that furnish the most useful scientific knowledge of the subject as it is related to irrigation canals up to the present time. Although it requires very little velocity to transport the silts of the Colorado the material in suspension settles rapidly when the water is brought to rest as in a reservoir, settling basin or test tube. When glass tubes one meter high are filled with the water the silt generally settles at the bottom in two hours to the extent that a definite mud deposit is formed leaving the water above apparently clear to the eye if not closely inspected. This mud column is at first often as much as 10 per cent of the total column of the water but as it gradually becomes more compact its height is reduced rapidly at first and gradually slower as time goes on. Generally after settling for 30 days which period was taken as the standard for settling tests in this investigation the height of mud column (the same being the percentage of mud by volume) ranged from one half to four per cent and the maximum in any test gave 7 per cent, this being water taken from the Imperial Canal during the time of a late summer flood in Gila River which tributary carries more silt than the Colorado itself. Further reduction in the height of the mud column after settling 30 days is slight. The difference as between settling 30 and 60 days is quite appreciable, but after 90 days it is hardly possible to measure further reduction with an ordinary scale. The ratio between percentage of silt by weight and the percentage of mud settling in quiet water is not fixed because the latter is itself not fixed and changes with the length of time of settlement but generally after settling 30 days or more the percentage of mud is two or three times the percentage of silt by weight. Hilgard, in discussing soils, states that clay is material fine enough to remain in suspension in water indefinitely. He further states that where the water contains salts in solution the salts may produce

coagulation until the greater weight of the aggregates thus formed cause settlement. The waters of the Colorado contain salts in sufficient amounts to produce coagulation and this explains why the silt settles rapidly in quiet water even though it is finer than required for the standard screen classification for clay. As long as the water is in movement coagulation and the resulting deposit of the finer materials are prevented. The complete report of the silt investigation is to be prepared by C. E. Tait and submitted for publication by the U. S. Department of Agriculture. During the early part of the investigation F. J. Veihmeyer and H. F. Blaney assisted in the work. Later their places were taken by F. D. Bowlus and H. M. Lukens. Towards the close of the field work Mr. Blaney again assisted. Aside from association with Mr. Peck, the Imperial Irrigation District's representative in the silt investigation, acknowledgement is due to the regular officials of the district also to the mutual water companies of Imperial Valley, the U. S. Reclamation Service at Yuma and the Palo Verde Mutual Water Company for aid rendered in various ways.

COST OF IRRIGATION WATER.

In 1919 the water users in San Fernando Valley obtaining irrigation water from the Los Angeles aqueduct at \$6.00 per acre foot appealed to the city of Los Angeles for a half rate to apply during seven winter months and for use in hearings before the Board of Public Utilities of the city they requested this division to furnish them with a statement of the cost of water under other irrigation systems in Southern California. As this subject is one of general interest such a statement was prepared by Mr. Tait by adding to office data already in his possession information collected by special inquiry from about 50 water companies. The water users failed to obtain a half rate for 7 months but did obtain it (\$3.00 per acre-foot) for 5 winter months. The demand for copies of the statement on cost of water for various other purposes including use in public utility water rate hearings before the California Railroad Commission increased to such an extent that it was deemed advisable to revise and extend the original report to be submitted for publication as a circular by the U. S. Department of Agriculture. The tabulation of the cost of water includes 84 of the larger and more typical of the 450 active incorporated mutual water companies of Southern California, also 17 public utility water companies selling water for profit under state regulation which is the greater number of the companies of this class in the southern part of the state. The tabulation of the information collected is completed and incidentally it includes the duty of water and the area of the crops irrigated as well as the cost for each company. A brief discussion of the results is being prepared.

In arriving at the cost of water under the mutual companies the method has been to take account of the interest on the capital stock, the assessment on the capital stock, and the charge for the water delivered. These three items include all of the cost except depreciation on the plant which has not been considered because it was not practical in this inquiry to do the vast amount of work that would be necessary to fairly determine depreciation. Next a deduction has been made from the sum of these of the amount put into a sinking fund to retire bonds and applying to such assets as the cost of works and rights because these contributions to retire the principal of indebtedness are not, like the interest paid on the principal, properly chargeable to the annual cost of water.

The data are for 1918, a year that will probably be more representative of water costs for several years hence than either 1919 or 1920 when prices were more advanced. Although many of the figures relating to the capital stock and cost of water as kept on the books of companies are in terms of the share of stock, all were reduced to the acre basis by taking into account the average ratio of shares per acre under each system so that the resulting figures obtained on cost of water are per acre per annum as represented by the year 1918.

Although the stock of incorporated companies is legally assessable in California, many mutual water companies, unless they are paying interest on bonds and provided they have a water rate do not assess the stock every year but only when they must incur some special expense such as for substantial improvements to their property. It rarely if ever happens, however, that a company does not have an assessment in five years.

For these reasons the average of the assessments for five years terminating with 1918 instead of the assessment for any single year has been used as being more fair in summing up the cost. On the other hand some mutual companies make no charge for the water delivered, but derive all revenue to meet expenses by assess-

ments on the stock. Many companies follow the logical plan of assessing the stock for improvements to the property which the capital represents and charging those who use the water in proportion to amount used to cover operating expenses.

The interest on the stockholders' investment in the capital stock has been calculated at 6 per cent on the market value of the stock in 1918 if there was an established market value, and if none it was calculated on the original par value. In most cases the market value exceeds the par value and it better represents the investment that would have to be made to obtain the water right at the present time. Under some of the mutual companies the water is legally made appurtenant to the land so that the shares of stock are transferable with the land, only, and consequently do not acquire any independent value. Under these companies the interest has been calculated on the par value. To these fixed charges proper account has been taken of any minimum, graduated or seasonal water rates. Some companies have a constant rate for all water used, others different rates for night and day use, others different rates for winter and summer, others a rate somewhat graduated downward with an increase in the amount of water used, and others a rate that is constant except for a minimum charge, generally for the first acre-foot.

The cost of the water per acre is the same as the cost of the first acre-foot for companies that make no charge for water. For the companies that charge for water, the cost per acre can not be obtained by multiplying the cost of the first acre-foot by the duty of water expressed in acre-feet per acre for the reason that interest and assessments are fixed and in some cases the rates are variable.

Under the public utilities the water rate represents the entire cost to the user and interest is a matter of concern for the corporation instead of the consumer. The Railroad Commission of California legally approves rates that allow a reasonable profit to the utilities. Nearly all of the utilities have some form of graduated instead of uniform water rates so that under them the cost of the water per acre is generally not a multiple of the cost of the first acre-foot.

On account of the complications that would arise from the many variable conditions influencing the cost of water it has not been possible to classify companies and summarize and compare costs according to source of water or crops irrigated or other plan, but the report being prepared will give for each system the approximate proportions of the water pumped and obtained by gravity, the area of each crop irrigated, and the duty of water as well as all of the basic figures relating to shares of stock, assessments, and water rates from which the fiscal costs have been calculated so the reader may draw his own conclusion as desired. For the purpose of this review the following brief summary is submitted.

By far the greater part of the area irrigated under the companies included in the tabulation exclusive of the Colorado River valleys is growing oranges and lemons. The other crops include deciduous fruits, walnuts, alfalfa and truck. Large areas of lima beans and sugar beets are grown along the Southern California coast, but they are only in part irrigated.

The duty of water excepting a few unrepresentative extremes due to water shortage ranges from .68 acre-foot under the Garvey Water Company irrigating deciduous fruits at San Gabriel to 4.00 acre-feet under the Palo Verde Mutual Water Company irrigating alfalfa and cotton through the long hot and dry season of the desert climate on Colorado River. Generally the duty of water for citrus fruits ranges from one to two acre-feet, the lower amounts being for pumped and the higher for gravity water. The cost of the pumped water is greater than of the gravity water and the results show that the cost and not the requirement is the greatest influence on the duty of water.

Following are first, the three lowest, second, the three highest costs of water and third the average cost and duty of water found among the entire 101 companies:

Name of company	Duty of water in acre-feet	Cost of first acre-foot of water	Cost of water per acre
Cate Ditch Company.....	2.40	\$1 12	\$1 12
Standefer Water Company.....	1.60	1 30	1 48
Los Nietos Irrigation Company.....	2.00	1 60	1 60
Glendora Irrigation Company.....	1.41	33 01	40 39
Le Verne Irrigation Company.....	2.16	24 00	41 40
Le Verne Land and Water Company.....	1.81	30 00	51 37
Average.....	1.96	15 68	

The three companies with low cost have old ditches from the lower part of San Gabriel River with water rights dating from the Spanish period. All the water is obtained by gravity and it is used on miscellaneous crops. The three companies with high cost pump all the water they use from wells, under lifts from 300 to 450 feet, and they irrigate oranges and lemons exclusively. They have contended with an unstable underground water level, have bored some wells which were failures, have been forced repeatedly to install new types of pumping machinery to meet the changing conditions, and they maintain improved distributing systems of underground pipe. Of the entire 101 companies listed the annual cost of the water per acre for 86 falls between \$5 and \$30, while for 49 it falls between \$10 and \$25.

The average cost of water under the seventeen public utilities is considerably lower than the average under the eighty-four mutual companies. This is accounted for by the fact that the companies now classed as public installed their systems and began to operate in the early period when there was surface water to appropriate and deliver cheaply while many of the mutual companies originated later when water could be had only by pumping at greater expense.

The cost of developing water is shown approximately by the par value of the capital stock of the mutual companies, although in some cases the capital covered cost of so called water rights, profit to land agents or commissions to promoters in addition to cost of works, while in other cases it did not cover all the cost of construction, a part of which was met by an original bond issue. For five of the eighty-four mutual companies the par value of the capital stock per acre exceeds \$150, while for eleven companies it is below \$20. The more common amounts of capitalization per acre are \$50 and \$100.

The value of the water does not depend entirely on the cost of development, but is also influenced by the priority of water right, reliability of supply, cost of delivery, indebtedness, crop values that may be produced with the water in the climate of the locality and finally supply of and demand for the shares of stock. The market value is in all cases but one either equal to or higher than the par value, the single exception being for unusual conditions. Investments in water development are, of course, not intentionally made in amounts exceeding the anticipated value of the water. Under only fourteen of the mutual companies does the market value of the stock per acre fall below \$100 and under seven it reaches \$300 or more. Stated in terms of the miners inch the value of one miners inch (50 miners inches = 1 sec. ft.) is \$1000 to \$1500 for pumped water and \$1500 to \$2500 for gravity water. The greater value of gravity water is largely due to better established rights and cheaper cost of operation.

F. D. Bowles, H. M. Lukens, Thos. H. McCarthy, and H. F. Blaney assisted in collecting and preparing the data on cost of water.

QUALITY OF IRRIGATING WATER.

The waters of Lake Elsinore were pumped over the rim of the lake and used to irrigate the citrus fruit orchards at Corona by the Temescal Water Company for several years during the nineties until the effect of the salty water on the trees became so disastrous that the use of the water had to be discontinued. Lake Elsinore is fed by the flood waters of San Jacinto River and only in an occasional year is it filled to overflowing. In late years the overflow occurred only twice, in 1890 and again in 1916. The overflow reaches Santa Ana River through Temescal Wash. The quality of the lake water was known prior to the flood of 1916 from analyses by Dr. Hilgard and others. After the flood of 1916 inquiries came to this division for advice on the quality of the water and recently proposals were made for the utilization of the lake waters for power development for a period of several years after which time it was believed by the advocates of the plan that the salt content in the lake would be reduced sufficiently to permit the use of the water for irrigation below the power plant. As any water drained from the lake would reach and affect the character of the water in Santa Ana River, supplying numerous irrigation canals, further inquiries were made for analyses of Santa Ana River both above and below the mouth of Temescal Wash and of San Jacinto River, which feeds Lake Elsinore, as well as of the lake itself.

In arranging to obtain the information desired the cooperation of Dr. W. P. Kelly, chemist of the Citrus Experiment Station of the University of California at Riverside, who made the analyses of the samples furnished him, was obtained and is gratefully acknowledged.

The samples from Lake Elsinore were taken from the middle of the lake in November, 1918, by H. M. Lukens of this division. The report of the analyses by Dr. Kelly is as follows:

"The samples of water from Lake Elsinore have been analyzed with the following results:

	Parts per Million	
	Sample No. 1	Sample No. 2
Chlorine (Cl) -----	611	611
Carbonate (CO) -----	78	75
Bicarbonate (HCO ₃) -----	366	363
Sulfate (SO ₄) -----	173	174
Nitrate (NO ₃) -----	2	2
Calcium (CA) -----	16	18
Magnesium (MG) -----	13	12
Sodium (NA ₂) -----	634	636
Silica (Si.c.iO ₄) -----	18	16

"You will note that the samples are almost identical in composition and in no particular do they vary beyond the range of analytical error.

"Water analyses are commonly reported on the basis of salts rather than in the form given above. For this reason I have made the conventional combinations for the major constituents in this water and submit them in the following table:

	Parts per Million
Sodium Chloride -----	1008
Sodium Carbonate -----	39
Sodium Bicarbonate -----	504
Calcium Carbonate -----	40
Magnesium Carbonate -----	45
Sodium Sulfate -----	256

"It is apparent that this water is not suitable for irrigation. In the first place it contains large amounts of black alkali which is commonly considered to be the most detrimental constituent. We consider both sodium carbonate and sodium bicarbonate as black alkali. The sodium chloride content is extremely high and finally, the sodium sulfate content is notable.

"This water has the the bad qualities just enumerated without having any redeeming qualities. The calcium and/ magnesium content, for example, is extremely low.

"Previous analyses published by the late Dr. E. W. Hilgard on samples drawn in January 1890, January 1891, the summer of 1897 and the summer of 1898, together with the analyses which we have just made, are submitted in the following table. In compiling this data I have taken the former analyses and expressed them in parts per million. The results were expressed in grains per gallon. In addition the previous analyses did not separate sodium carbonate from sodium bicarbonate, but expressed the two as sodium carbonate. Sodium bicarbonate upon being converted into sodium carbonate undergoes a loss of carbonic acid. Consequently we are not justified in adding together the sodium carbonate and the sodium bicarbonate expressed in table two. By determining the amount of sodium carbonate equivalent to 504 part of sodium bicarbonate, then adding the sodium carbonate we arrived at the amount of sodium carbonate that corresponds to the determinations submitted by Dr. Hilgard.

Composition of Lake Elsinore at Different Dates.

	1890	1891	1897	1898	1918
Sodium chloride -----		741	804	917	1008
Sodium sulfate -----		254	344	377	256
Total Sodium sulfate and chloride -----	1300	995	1148	1294	1264
Sodium carbonate -----	328	233	360	391	327

"The most notable feature of these analyses is found in the progressive increase in sodium chloride. The analysis in 1890 does not show the separate amounts of sodium chloride and sodium sulfate, but rather the total. Since that time, however, a steady increase of sodium chloride has taken place. Sodium sulfate, on the other hand, has undergone some fluctuation. The same may be said with respect to the sodium carbonate.

"On the whole, however, the amounts of this constituent have not varied greatly. According to Dr. Hilgard's statements submitted in the annual report of the College of Agriculture 1890 Lake Elsinore overflowed for four months during the spring and early summer of 1890. The drop in alkali noted in 1891 over that of 1890. Dr. Hilgard attributes to the dilution of the heavy rains during the rainy season of 1890, but he states that "Even with this dilution the water in Elsinore Lake is too strong in alkali salts to be used for continued irrigation purposes. It would do for a few years and then the land would be dead with alkali, black alkali at that."

Plans were made for sampling the stream waters once per month for about one year, or for a period long enough to cover possible seasonal changes. In this part of the work several corporations rendered valuable assistance by having employees stationed at power houses or visiting canal intakes on the streams in the course of their regular duties. The samples from San Jacinto River, near the Mountain canyon, were taken by the Citizens' Water Company of San Jacinto, those from Santa Ana River at Colton and from Warm Creek by the Riverside Water Company. The samples from San Jacinto River, near Lake Elsinore, the Santa Ana River at the Riverside-Orange County line, and from San Gabriel River were taken by F. D. Bowles and others of this division. Warm Creek was included because, unlike other tributaries of the Santa Ana, it has its source in springs in San Bernardino Basin and not in Mountain drainage. The single sample from the San Gabriel was taken for comparison. The analyses of the stream waters by Dr. Kelly follow. Quantities are parts per million.

San Jacinto River Near Mountain Canyon (1915).

	*March	*April	**May	**June
Total solids -----	177	117	238	217
Chlorine (Cl) -----	15	9	17	15
Carbonate (CO ₃) -----				
Bicarbonate (HCO ₃) -----	112	73	146	148
Sulphate (SO ₄) -----	6	10	10	11
Nitrate (NO ₃) -----				
Calcium (Ca) -----	19	17	30	32
Magnesium (Mg) -----	7	2	4	7
Sodium (Na) -----	26	16	36	23
Silica (SiO ₂) -----	66	40	15	9

*Samples taken at intake of Citizens Water Company of San Jacinto.

**Samples taken at intake of Lake Hemet Water Company.

San Jacinto River Near Lake Elsinore (1919-20).

	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Total solids -----	1,151	1,156	1,139	603	1,933	848	1,296	2,069	1,673	936	1,396	1,526
Chlorine (Cl) -----	318	318	285	171	538	270	447	1,031	612	273	534	135
Carbonate (CO ₃) -----		12										
Bicarbonate (HCO ₃) -----	253	146	240	189	522	165	250	256	207	300	183	317
Sulphate (SO ₄) -----	268	267	197	50	190	109	143	231	224	69	430	512
Nitrate (NO ₃) -----	9	6	11	5	7	2	9	9	9	6	10	4
Calcium (Ca) -----	51	98	94	50	112	46	50	89	125	60	184	168
Magnesium (MgO) -----	21	46	44	20	62	22	54	77	52	24	76	66
Sodium (Na) -----	296	264	198	108	465	189	311	652	303	200	256	207
Silica (SiO ₂) -----	30	25	25	26	34	46	30	26	32	32	36	32

Santa Ana River Near East Highlands (1919-20).

	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Total solids -----	269	244	325	168	187	284	293	280	272	325	172	*
Chlorine (Cl) -----	7	9	11	9	6	9	9	12	12	8	9	-----
Carbonate (CO ₃) -----			6									-----
Bicarbonate (HCO ₃) -----	146	107	179	153	140	146	140	153	128	146	116	-----
Sulphate (SO ₄) -----	62	75	84	4	13	82	89	77	74	67	19	-----
Nitrate (NO ₃) -----							4	2				-----
Calcium (Ca) -----	24	38	51	27	26	36	34	37	36	27	26	-----
Magnesium (MgO) -----	10	10	10	7	10	10	8	11	8	10	7	-----
Sodium (Na) -----	34	20	44	13	16	36	45	83	38	39	16	-----
Silica (SiO ₂) -----	16	15	20	12	15	25	31	14	16	20	16	-----

Santa Ana River at Colton (1919-20).

	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Total solids -----	304	369	296	480	Dry	Dry	Dry	300	274	256	316	452
Chlorine (Cl) -----	17	24	15	33	Dry	Dry	Dry	14	14	10	17	33
Carbonate (CO ₃) -----		12	12		Dry	Dry	Dry					
Bicarbonate (HCO ₃) -----	204	232	146	320	Dry	Dry	Dry	176	183	170	210	278
Sulphate (SO ₄) -----	37	46	32	56	Dry	Dry	Dry	34	39	35	46	66
Nitrate (NO ₃) -----	3				Dry	Dry	Dry		2			4
Calcium (Ca) -----	43	56	40	58	Dry	Dry	Dry	42	40	42	38	43
Magnesium (Mg) -----	10	16	10	16	Dry	Dry	Dry	10	10	10	11	19
Sodium (Na) -----	36	29	37	63	Dry	Dry	Dry	34	28	20	46	70
Silica (SiO ₂) -----	23	43	65	30	Dry	Dry	Dry	56	40	56	32	37

Santa Ana River at Riverside-Orange County Line (1919).

	March	April	May	June	July	October
Total solids -----	451	422	515	535	527	520
Chlorine (Cl) -----	50	50	69	80	89	87
Carbonate (CO ₃) -----	6	12				
Bicarbonate (HCO ₃) -----	238	232	244	230	226	222
Sulphate (SO ₄) -----	52	50	60	67	78	78
Nitrate (NO ₃) -----	9		9	10	18	16
Calcium (Ca) -----	60	66	73	71	63	62
Magnesium (Mg) -----	20	18	16	10	18	17
Sodium (Na) -----	35	37	60	80	89	73
Silica (SiO ₂) -----	24	29	20	21	28	24

Warm Creek Near Highlands (1919-20).

	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Total solids -----	*	*	282	311	309	294	298	304	306	304	310	312
Chlorine (Cl) -----			18	15	17	15	15	17	15	12	17	14
Carbonate (CO ₃) -----												
Bicarbonate (HCO ₃) -----			150	162	218	201	189	204	200	201	195	192
Sulphate (SO ₄) -----			36	40	41	33	44	52	39	46	42	41
Nitrate (NO ₃) -----				2	2	3	2	2	6	2	2	4
Calcium (Ca) -----			37	40	48	49	50	54	49	56	38	38
Magnesium (Mg) -----			8	9	11	10	9	12	9	10	9	10
Sodium (Na) -----			39	34	29	26	28	24	31	24	44	43
Silica (SiO ₂) -----			16	26	23	24	25	28	20	20	24	28

*Not sampled.

San Gabriel River Three Miles Above Mouth of Canyon (1919).

	March	March
Total solids -----	240	Nitrate (NO ₃) -----
Chlorine (Cl) -----	6	Calcium (Ca) -----
Carbonate (CO ₃) -----		Magnesium (Mg) -----
Bicarbonate (HCO ₃) -----	217	Sodium (Na) -----
Sulphate (SO ₄) -----	23	Silica (SiO ₂) -----
		42
		10
		16
		23

ADVISORY WORK.

In addition to the investigations on the major subjects numerous matters have been handled in an advisory capacity upon requests from the public. For most of these no reports were made in writing. Some of the more formal matters are mentioned in the following:

Marygold Mutual Water Company.

In the winter of 1919 water users under the Marygold Mutual Water Company at Bloomington, San Bernardino County, petitioned this bureau for advice in adjusting differences between themselves and the promoters of the enterprise. The settlers had contracted to purchase most of the lands of the promoters to which the water system was appurtenant, but had not completed payment and gained title to a majority of them, hence they were unable to vote the water company stock and the promoters controlled the system, which was operated mainly for their own farming operations. Differences arose as to the management and proper distribution of the cost. The organization and works were reviewed and a report was prepared covering the following: The organization and history of the company, description of water sources and works, detailed estimates of original cost of works and of present replacement cost, cost of operation, and discussion of complaints with recommendations for their settlement. The report was instrumental in giving a better understanding of the difficulties and in bringing about needed adjustments.

Moreno Mutual Irrigation Company.

In the summer of 1919 land owners at Moreno, Riverside County, who later incorporated the Moreno Mutual Irrigation Company, requested advice on the feasibility of obtaining irrigation water from cienegas, near El Casco, on San Timoteo Creek, and on the form of organization for a mutual company. The proposed water sources were examined in company with W. A. Johnstone of the State Water Commission, and a written report was prepared estimating the amount of water that might be developed, barring possible legal objections, which were suggested. Advice was given in conference on the organization of a company. The company after being incorporated purchased the water bearing lands and applied to the State Water Commission for a permit to appropriate the water. The application is being opposed by water users on San Timoteo Creek, but the company is proceeding with preliminary tests of the water supply.

Underground Waters Santa Maria Valley.

In the winter of 1918, on request of the Chamber of Commerce of Ramona, San Diego County, a study was made of the underground water development possibilities in Santa Maria Valley. Some of the citizens proposed that the town bore a deep test well in the hope of obtaining flowing water. Advice was given against such procedure. Water-Supply Paper No. 446 by Lee and Ellis of the U. S. Geological Survey on the Geology and Groundwaters of the Western Part of San Diego County since issued sustains the opinion. The valley fill along the Santa Maria is shallow and is underlaid with granite from which no water could be obtained. Wells bored down to the granite in parts of the valley should with pumping yield small streams for water for irrigation use.

Yucaipa Water Supply.

At the request of non-resident owners of land in Yucaipa Valley, San Bernardino County, a brief report in writing was prepared with the assistance of H. M. Lukens in the winter of 1918 on the water sources and systems of Yucaipa Water Company No. 1 and of the South Mesa Water Company which together furnish the irrigation water for the valley. The report also discussed the possibility of increasing the amount of water by storage or other means.

Purchase of Utilities by Consumers at San Jacinto and Hemet.

On invitation a number of conferences were had with committees of the water users, and their attorneys, under the Citizens' Water Company of San Jacinto and the Lake Hemet Water Company for the discussion of the proposed purchase by the users of the utilities. Both corporations are desirous of selling their systems but the land owners being served are uncertain as to the value and the best kind of organization under which to proceed, while some of them are opposed to the proposal in any form. The proposed transfer of each system originated independently

of the other but the plan of acquiring and combining the two has been considered. For many reasons the consolidation would be desirable yet there are some obstacles in the way of its accomplishment. Both the irrigation district and the mutual water company plans have been considered and both were outlined to the committees.

The water users further request advice on the possibility of increasing the water supply and supplying more land under these systems. It has not yet been possible to do more on this matter than make a preliminary inspection of the mountain watershed of San Jacinto River and of one possible reservoir site which might be utilized. It is hoped that more attention can be given the subject at an early date.

Victor Valley Reclamation Problems.

A conference called by the Board of Supervisors of San Bernardino County was attended in 1919 to discuss means of harmonizing conflicting interests on Mojave River for the reclamation of Victor Valley. This was attended by representatives of Farm Bureau, the chambers of commerce of San Bernardino, Redlands and Victorville, the Mojave River Irrigation Districts, the Victor Valley Irrigation District, the Arrowhead Reservoir and Power Company and the Appleton Land, Water and Power Company.

The suggestions made in Bulletin No. 5 of the State Department of Engineering were recognized as indicating solution of the difficulties but up to the present time no real progress has been made toward the reclamation of the Victor Valley mesas.

Fontana Water Supply and Rights.

Recently the Federal Board of Vocational Education for Disabled Soldiers, Sailors and Marines requested advice on the water supply and rights of the Fontana settlement as a possible site for an agricultural colony for ex-service men. The examinations for a report on this subject have been made but the report has not yet been completed. A suit has been filed by the City of San Bernardino against the Fontana Water Company and others over the water rights on Lytle Creek, but it is probable that this will be compromised.

Direct Aid to State Engineer.

Considerable work has been done on a number of subjects relating to the administrative work of the State Department of Engineering on irrigation matters which were taken up at special request of that Department. Some of this work has been directly with the State Engineer and for all of it the written reports and data have already been filed in his office, therefore only brief mention of the subjects are made here.

Pacific Colony.

Examinations of water supplies for a site for the Pacific Colony mentioned in the last State Engineers report were continued into the year 1919. After the site near Spadra was selected the tests of wells along San Jose Creek previously made were supplemented by tests of five wells bored on the site. A report on the history, utility, and value of the Alkire Tunnel considered as a supplemental water source for the Colony was made. This tunnel is located in the City of Pomona and has delivered 40 miner's inches or more during each summer of its existence. The tunnel is now leased by a mutual water company which expects to develop enough water for its own use on its own lands after which time the tunnel is to be for sale. Two weirs were installed in the tunnel to determine whether a gain or loss occurred in that part of the tunnel outside of the Palomares Cienega which it drains.

Water for Whittier State School.

With a view to bettering the water supply of the Whittier State School attention has been given to possible improvements for the Rincon Ditch which takes water from San Gabriel River and supplies the school at its lower end. During the summer of 1919 a shortage of water was felt by the users under the ditch and especially by the school.

The ditch is operated in three sections, the conduit in the upper and middle, being of underground concrete pipe, and the lower of earth ditch. Early in 1920 permanent weirs were installed at the head of the ditch and at the entrance of the school property to measure the water diverted and received by the school. Intermediate current meter measurements indicated that most of the loss from the ditch occurred

from the lower earth section and the lining of the section is much needed. In the summer of 1920 the Rincon Ditch Company filed suit against one or more of the appropriators on the San Gabriel immediately above the ditch.

Water Supply for Fullerton Irrigation District.

In May, 1919, F. D. Bowlus made tests of seven of the ten pumping plants on the Bastanchury Ranch near Fullerton, Orange County, to determine if they would furnish enough water to supply the lands being included in the Fullerton Irrigation District. The wells and plants were found adequate. This district was organized for the lands of a large estate in young orange orchard and already irrigated. The need of the district was not then apparent and the organization is now being dissolved.

Proposed Huntington Beach Irrigation District.

Together with F. W. Stanley a report was prepared in August, 1919, on the plans for the proposed Huntington Beach Irrigation District to include 2650 acres near Huntington Beach, Orange County. It was proposed to appropriate the flow of Freeman River, a sluggish stream which drains some of the moist coast lands and a portion of the Talbert Drainage District to the ocean. The water would have to be lifted by pumps to the Huntington mesa. The stream flow was measured and found to be sufficient and the quality of the water tested, and found to be suitable but no district organization has been completed.

IRRIGATION DISTRICTS.

Following the enactment of the so-called Wright Act in 1887 within eight years fifty irrigation districts were created. Few or none had been carefully considered before being organized. Some had but little or no water available, and no knowledge of the requirements of irrigation or the cost of providing works.

History shows that under the Wright Act the number of districts organized each year was as follows:

1887	-----	4
1888	-----	7
1889	-----	6
1890	-----	10
1891	-----	13
1892	-----	4
1895	-----	1
Total	-----	50

Amargoza district in Los Angeles County was the last one attempted to be organized under the Wright Act, but it was immediately abandoned.

As a consequence of the unfavorable conditions attending their birth, few reached adolescence. Indeed, only nine of the entire number are in operation today. Some of these, after many and long struggles, succeeded in effecting compromises with their creditors at figures ranging from 12 to 75 cents on the dollar of indebtedness, refunded their bonds, have secured their water, built the works and become prosperous.

Three are irrigating only a few acres each but are maintaining their district organization.

Some others have maintained existence but in a somnolent condition, and have not yet awakened. Walnut district never incurred debt and has had no trouble.

One district, Happy Valley, issued no bonds, acquired no property, and was considered dead, but in 1917 it was revived by an act of the legislature legalizing its organization. Since awakening it has formulated new plans for its complete development, issued bonds under the guidance of the Bond Commission and now has its works well along toward completion.

Bulletin No. 2 of this department, "Irrigation Districts in California," by Mr. Frank Adams, Irrigation Manager, United States Department of Agriculture, was published in 1917, and gives a complete history of the rise and fall of the irrigation district movement in California. It proved so popular that the edition was exhausted in a short time and was republished as an appendix to the sixth Biennial Report of the Department, 1918. The continued demand for it compelled the issuance of a second edition, which also is exhausted.

In 1897 the Wright Act was supplanted by the Bridgeford Act, under which, with its various amendments, the reorganization of the old districts was effected and under whose provision all recently organized districts have been formed.

Notwithstanding the new law which promised better safeguards than the old law, no desire to test it was manifest until 1909 when Oakdale and the South San Joaquin districts were organized. The next to follow were the "pygmy" of districts, San Ysidro in San Diego County, 485 acres, and the "giant," Imperial, 583,000 acres, both created in 1911.

In 1913 the legislature amended the law requiring that the feasibility of proposed districts should be determined by the State Engineer before the organization could be authorized by the Board of Supervisors.

If the examination discloses that the project is not feasible and the report so states, the Board of Supervisors must reject the petition but may permit the organization according to such changes as the report may suggest.

Should the State Engineer be unable to report within 90 days the board may organize the district, but if the petition is rejected upon the report of the State Engineer and a further petition be presented, signed by three-fourths of the land owners requesting it, the formation of the district will be effected despite the adverse report.

When the act requiring all proposed districts to be examined became effective there were 13 districts in existence, nine of the original 50 organized under the Wright Act and the four above named created under the new Bridgeford Act.



PLATE XI. A. Imperial Valley—1853.



PLATE XI. B. Imperial Valley—1920.

RECLAMATION BY IRRIGATION.

NOTE.—The upper picture, reproduced from a government publication, represents an emigrant train crossing the Colorado Desert now Imperial Valley, in 1853. The lower picture reproduces a photograph taken in May, 1920. Cotton and alfalfa fields stretch to the base of Signal Mountain, shown in the background of both pictures.



PLATE XII. A. American Basin Before Reclamation.



PLATE XII. B. Same Place One Year Later. (Courtesy Natomas Company.)

RECLAMATION BY DRAINAGE.

NOTE.—The upper picture was taken before the levees were closed and the basin unwatered. The lower picture taken one year later. Notice the grain up to the men's chins..

This and Plate XI illustrate two types of diametrically opposite types of reclamation successfully accomplished.

At the close of 1918, the date of the 6th biennial report of this department, there were 44 districts recorded.

During the biennium just closed 49 petitions were presented to various county boards of supervisors praying for the formation of irrigation districts, all of which were referred to the Department of Engineering for investigation.

Of these one was received at a season when weather conditions prevented a field examination being made and the district was formed without action by the State Engineer. Forty-three investigations were made and reported upon while five projects are awaiting investigation at this date, November 1.

In addition to the above, two projects were examined in advance of effort to organize a district and no petition has yet been presented in either case.

Of the 43 projects reported upon 26 were approved without change, two were approved with modifications, seven were disapproved and four withdrawn or abandoned, while four projects have been approved upon which further proceedings are still pending.

Of those approved 23 completed their organization while five failed of organization at the elections.

Two of those disapproved presented petitions to their respective boards of supervisors, signed by the requisite three-fourths of the land owners. One of them was organized despite the adverse report, while the election on the other is pending.

In February, 1919, Big Rock Creek district, Los Angeles County, organized in 1890, but which has never been successful as a district, was dissolved by decree of the Superior Court.

Summarized, the organization of districts appears as follows:

Districts organized on approved and amended projects.....	23
Districts organized on three-fourths petition.....	1
Districts organized without investigation.....	1
<hr/>	<hr/>
Total number of new districts.....	25
Number of districts previously reported.....	44
<hr/>	<hr/>
Total districts organized.....	69
Number of districts dissolved.....	1
<hr/>	<hr/>
Number of districts in existence November 1, 1920.....	68

The following table is a complete list of all irrigation districts existing in the state on November 1, 1920, with data concerning each:

IRRIGATION DISTRICTS.

Name of district	County	Year organized	Area acres	Bonded indebtedness	Address of Secretary
1. Alpaugh	Tulare	1914	7,576	\$280,000	Alpaugh
2. Alta	Tulare-Fresno	1888	130,000	1453,000	Dinuba
3. Anderson-Cottonwood	Shasta	1914	32,500	1,255,000	Anderson
4. Baxter Creek	Lassen	1916	11,000		Lassen
5. Beaumont	Riverside	1919	5,161	230,000	Beaumont
6. Black Rock	Inyo	1915	1,210		Big Pine
7. Browns Valley	Yuba	1888	244,328		Browns Valley
8. Byron-Bethany	Contra Costa	1919	17,690	576,000	Byron
9. Cardiff	San Diego	1916	700		Cardiff
10. Carmichael	Sacramento	1915	3,113	90,000	R. F. D. No. 3, Fair Oaks
11. Citrus Heights	Sacramento	1920	2,948		R. F. D. No. 3, Sacramento
12. Coreoran	Kings	1919	48,438	760,000	Coreoran
13. Cordua	Yuba	1919	5,422	192,000	Marysville
14. Crooks Canyon	Modoc	1919	6,480	80,000	Alturas
15. Compton-Delevan	Colusa	1921	12,655	575,000	Colusa
16. Fair Oaks	Sacramento	1917	4,000	200,000	Fair Oaks
17. Feather River	Sutter	1920	3,027		Nicolaus
18. Foothill	Fresno	1923	58,000		Orosi
19. Fresno	Fresno	1920	242,000		Fresno
20. Glenn-Colusa	Colusa-Glenn	1919	103,000		Willows
21. Happy Valley	Shasta	1891	18,216	615,000	Olinda
22. Honey Lake Valley	Lassen	1896	33,150		Amadee
23. Honeycut-Yuba	Yuba-Butte	1919	26,530		Honeycut
24. Hot Spring Valley	Modoc	1919	51,200	96,000	Alturas
25. Imperial	Imperial	1911	603,840	8,500,000	El Centro
26. Jacinto	Glenn	1918	11,300	230,000	Glenn
27. James	Fresno	1919	26,108	1,000,000	San Joaquin
28. Knightsen	Contra Costa	1919	7,800		Knightsen
29. La Mesa, Lemon Grove and Spring Valley	San Diego	1913	11,794	3,232,500	La Mesa
30. Laguna	Fresno	1919	30,400		Laton
31. Lemoore	Kings	1920	52,301		Lemoore
32. Lindsay-Strathmore	Tulare	1913	15,285	1,650,000	Lindsay
33. Little Rock Creek	Los Angeles	1892	3,072	60,000	Littlerock
34. Lone Tree	Contra Costa	1920	2,393		Brentwood
35. Long Valley Creek	Lassen	1916	34,000		Doyle
36. Madera	Madera	1920	358,000		Madera
37. Maxwell	Colusa	1918	8,000	260,000	Colusa
38. Merced	Merced	1919	181,921		Merced
39. Modesto	Stanislaus	1887	81,183	4,209,261	Modesto
40. Mojave River	San Bernardino	1917	27,965		Victorville
41. Newport Heights	Orange	1918	1,501	160,000	Harper
42. Newport Mesa	Orange	1918	670	50,000	Harper
43. Oakdale	Stanislaus - San Joaquin	1909	74,246	2,390,500	Oakdale
44. Oroville-Wyandotte	Butte	1909	17,700		Oroville
45. Palmdale	Los Angeles	1916	4,756		Palmdale
46. Paradise	Butte	1916	11,250	400,000	Paradise
47. Plainsburg	Merced	1920	5,717		Plainsburg
48. Princeton-Codora-Glenn	Glenn-Colusa	1917	13,861	175,000	Willows
49. Provident	Glenn-Colusa	1918	20,886	1,000,000	Willows
50. Redrock Creek	Lassen	1918	3,700		Ravendale
51. Riverdale	Fresno	1920	16,000		Riverdale
52. San Ysidro	San Diego	1911	492	25,000	San Ysidro
53. Scott Valley	Siskiyou	1917	6,540	125,000	Fort Jone
54. Southern Lassen	Lassen	1915	21,500		Doyle
55. South San Joaquin	San Joaquin	1909	71,050	3,835,000	Manteca

¹Alta district issued bonds for \$543,000, but has reduced the amount to the figures stated by the purchase of bonds before maturity with surplus funds.

²Browns Valley district irrigates less than 5,000 acres.

³Only a small portion of these bonds have been sold.

⁴Little Rock Creek district originally embraced about 4,500 acres but has been reduced by exclusions.

IRRIGATION DISTRICTS—Continued.

Name of district	County	Year organized	Area acres	Bonded indebtedness	Address of Secretary
56. Stratford -----	Kings -----	1915	9,200	-----	Stratford
57. Surprise Valley -----	Modoc -----	1918	17,500	-----	Fort Bidwell
58. Terra Bella -----	Tulare -----	1915	12,000	1,000,000	Terra Bella
59. Tranquillity -----	Fresno -----	1917	11,300	260,000	Tranquillity
60. Tulare -----	Tulare -----	1889	31,360	-----	Tulare
61. Tule -----	Lassen -----	1920	15,305	-----	Standish
62. Turlock -----	Stanislaus-Merced -----	1887	178,798	6,770,000	Turlock
63. Victor Valley -----	San Bernardino -----	1917	71,517	-----	Victorville
64. Walnut -----	Los Angeles -----	1893	869	-----	Riviera
65. Waterford -----	Stanislaus -----	1914	13,577	670,000	Waterford
66. Webster -----	Madera -----	1915	15,000	-----	Madera
67. West Side -----	San Joaquin -----	1915	11,700	410,000	Tracy
68. Williams -----	Colusa -----	1920	9,661	-----	Williams

The 68 districts embraced in the above table are distributed from end to end of the state and are grouped geographically, with their respective group areas as follows:

In the Great Basin, east of the Sierras -----	8 districts,	147,460 acres
In the northwest coast (Klamath) drainage -----	1 district,	6,540 acres
In the Pit River Basin -----	2 districts,	57,200 acres
In Sacramento Valley -----	18 districts,	350,473 acres
In San Joaquin Valley -----	27 districts,	1,712,173 acres
In southwest coast counties Los Angeles to San Diego -----	7 districts,	24,189 acres
In Mojave desert region -----	4 districts,	106,182 acres
In Colorado drainage basin (Imperial) -----	1 district,	603,840 acres

Totals ----- 68 districts, 3,008,053 acres

Most of the districts are in complete operation; several have not yet completed their works while still others have not been able to acquire water or begin construction. A few, it is believed, will never be able to finance their projects unless state or government assistance in some form can be obtained.

The sources of water supply and the methods of procuring it are various.

Some districts are dependent upon pumping from wells. Some have stream water delivered by gravity flow, while others pump water from the streams.

Others again are dependent solely upon stored winter water while still others store water to supplement an inadequate summer stream-flow. Some also pump from wells to make up a deficient surface supply.

Several are preparing to build reservoirs in the mountains for storage of water for summer use, and with the inherent power in the water generate electric energy to pump underground water to part of the district lands.

In the Great Basin group, above indicated, only two are in a position to irrigate any portion of their lands, and these only to a limited extent without storage, for which they have not yet provided funds.

The Mojave Desert group embracing 106,182 acres, can irrigate no more than 3,000 acres unless storage be provided. With complete conservation of all of the waters available it would be possible to irrigate from 45,000 to 55,000 acres in all of these districts, but so far no way has been discovered to finance the enormously expensively storage projects required.

In the southwest group one district depends upon surface water supplemented by wells, two others have only storage possibilities, while the other four obtain their water from underground sources alone.

Imperial district obtains its water by gravity from the Colorado River. Its canal system irrigates about 400,000 acres in the district as well as something more than 200,000 acres in Mexico.

The one district in the Klamath River Basin has only surface water delivered by gravity flow.

The two Pit River districts will depend almost wholly upon stored water for their irrigation.

The Sacramento Valley districts aggregate 350,474 acres, and the San Joaquin Valley group embraces 1,712,173 acres, or a total of 2,062,647 acres incorporated in irrigation districts in the Great Valley of California.

In the San Joaquin and Sacramento Valley groups, 993,142 acres are dependent upon gravity flow, supplemented in some instances by underground water. Of this total area about one-fourth pumps from the streams.

Underground sources constituted the sole supply for 55,578 acres by pumping from wells. Storage reservoirs are installed or contemplated to serve 1,171,124 acres.

A summary of the above relating to the Great Valley drainage basins, including Pit River appears as follows:

Are a dependent on material flow, gravity supply----	766,126 acres	
Pumped from streams-----	227,019 acres	
		993,145 acres
Area dependent on stream flow with storage-----		1,171,124 acres
Area dependent on underground sources alone-----		55,378 acres
Total area embraced in irrigation districts-----		2,219,847 acres

IRRIGATION DISTRICT BONDS.

In 1911, an act was passed providing that when bonds of a district were certified by the State Controller, they should be available for all the purposes that other municipal bonds are.

To obtain the certificate named the entire project to be approved by the Superintendent of Banks, Attorney General and State Engineer. For convenience this body is called the Bond Commission.

The effect of the certification of irrigation district bonds has been that where, before this law was enacted, they were hardly salable at 75 to 80 per cent of par, the same bonds are now quoted as 108 and new issues frequently bring 97 or more at the first offering.

The legislature of 1919 amended the provision of law relating to bonds so as to require that all projects for the issuance of bonds should be submitted to the Irrigation District Bond Commission to determine the amount of bonds necessary to raise the required funds.

The State Engineer is a member of the Bond Commission and all investigations into the engineering feature of the projects for the issue of bonds, or for their certification by the State Controller after being issued, are assigned to the Department of Engineering.

Since the last report the Department has investigated projects for the issuance of bonds amounting to eleven million dollars. Some were first issues by nearly formed districts for the purpose of acquiring water systems. In most cases existing works were purchased and extensions and improvements added to conform to the district requirements. Two notable exceptions were the issuance of \$6,000,000 of bonds by Turlock and Modesto districts for the prime purpose of constructing a large reservoir on the Tuolumne River to store water for the use of both districts, and to extend and improve their present irrigation and drainage systems.

The following bond projects were investigated and approved:

District	Amount
Beaumont	\$630,000
Byron-Bethany	550,000
Corcoran	760,000
Cordua	192,000
Compton-Delevan	575,000
James	1,000,000
Modesto	2,000,000
Newport Heights	160,000
Newport Mesa	50,000
Princeton-Codora-Glenn	175,000
Provident	1,000,000
Scott Valley	125,000
Tranquillity	260,000
Turlock	4,000,000
	<hr/>
	\$11,477,000

Several other districts have made application for estimates of bond issues for which investigations have been made, but for various reasons reports thereon have not yet been formulated.

Investigations of the many irrigation projects made for organization and bond issues during the last two years were conducted by members of the staff as follows:

The State Engineer, in person.
Mr. P. M. Norboe, Chief Assistant State Engineer.
Mr. J. Burdette Brown, Assistant State Engineer.
Mr. S. C. Whipple, Assistant State Engineer.
Mr. S. W. Curtis, Former Assistant State Engineer.
Mr. Harry Barnes, Special Examiner.
Mr. Harry H. Blee, Special Examiner.
Mr. W. L. Huber, Special Examiner.

In making the investigations the Department has received valuable assistance and advice from Mr. Chas. H. Lee, Executive member of the State Water Commission; from Dr. Samuel Fortier, and Prof. Frank Adams, personally, and from the reports of Mr. A. L. Fellows on irrigation possibilities in Kern County and ground waters of Madera County; and of Messrs. Frank Adams, A. T. Michelson, F. C. Scobey, W. W. McLaughlin, C. E. Tait and others of the staff of Dr. Fortier's office on various matters affecting projects.

MISCELLANEOUS INVESTIGATIONS.

The succession of dry years experienced by the State, beginning with 1917, attended by unprecedentedly small flow of water in the streams, has demonstrated most forcibly that irrigation development has reached its limit unless conservation of the water resources can be established. This can be brought about partly by learning and applying more economical use of the water. The investigations conducted by the co-operative agencies detailed elsewhere are busily engaged in acquiring data along these lines, which it is hoped will be of service in educating the water user how to make a given quantity of water go farther.

But the greater conservation is in controlling the wild destructive flood waters by storing them for summer use.

The Department of Engineering has bent every energy and used every financial resource available to it in prosecuting research to acquire reliable data on conservation possibilities. Cooperation has been established wherever possible by securing funds from persons, corporations and municipalities, to augment the meager funds of the Department.

Iron Canyon.

In cooperation with the United States Reclamation Service and with funds made up from allotments by the Service, and the Department and moneys subscribed by public and civic bodies interested, such as the County of Tehama, City of Red Bluff, the Sacramento Valley Development Association and others, a survey has been made of this great project.

Careful investigation was made of the dam site which the Department Engineers had always regarded with doubt. Extensive borings were made which demonstrated the unfitness of the site, but further search discovered another site suitable for the purpose.

Surveys were made for canals to irrigate the lands on the west side of the valley. Surveys on the east side of the valley will be made as soon as funds can be secured, which have been promised by the Chamber of Commerce of Chico and others.

Calaveras River.

An intense study for flood control of this stream was made in which it was developed that a reservoir could be built to control the floods which would provide stored water for the irrigation of about 50,000 acres of land. Borings were made which proved the dam site to be suitable.

A report of this work was published by the Department entitled "Flood Problems of the Calaveras River," by Harry Barnes.

A project is being formed in San Joaquin County to control the water and develop the resources of the Calaveras at the cost of \$1,500,000, based upon the data obtained.

Kings River.

In cooperation with the United States Bureau of Public Roads, a study was made of the water resources of Kings River and their present administration.

Bulletin No. 7, "Use of Water from Kings River," was published. Several irrigation districts were organized with the purpose of jointly constructing reservoirs and other works to utilize all of the waters of Kings River and prevent destructive wastes of flood waters. It is probable that additional legislation will be required before a comprehensive cooperation can be established.

Kaweah and Tule Rivers.

Department Engineers have devoted some study to the conservation of the waters of these streams, but investigations are not completed.

Kern River.

Engineers have been investigating the use and abuse of the water resources of this great stream and of the possibilities of conservation. The investigations are still in progress.

Yuba-Nevada Counties.

An intensive study of water resources of portions of these counties has been made, particularly of the Yuba River, with a view of their utilization on the foothill lands. It is hoped that the results of the investigations can be published in a bulletin in the near future.

Placer County.

Some attention has been given to the possibilities of extending the wonderful fruit belt of the foothill region of this county. Two reservoir sites have been examined, and properties interested have contributed funds for a survey of one of them, the Department's funds being too low to finance a survey. Work will soon be started and it is expected will be completed early in December.

SNOW SURVEYS.

In former reports this Department has pointed out that in all artificial reservoirs accurate records are kept so that it is known every day how much water is available for future use, but that no knowledge whatever is possessed at any time of the quantity of water stored in the vast snowfields at the heads of the streams, which must come down when warm weather melts the snow.

The Department in the winter of 1917-18 inaugurated in a small way, a study of the subject, but for lack of equipment and shortage of funds the work accomplished was limited.

Professor J. E. Church, Jr., of the University of Nevada, actuated by solely a passion for scientific research and a love for "life in the open," had been for several years conducting studies of the phenomena connected with precipitation in the form of snow.

In cooperation with the University the local representative of the United States Weather Bureau and sympathetic friends, Professor Church had accumulated some valuable meteorological apparatus and had established an observatory on the summit of Mount Rose at an altitude of 10,800 feet, overlooking Lake Tahoe.

This observatory was equipped with self recording instruments which run continuously and made written record or "graph" showing the meteorological conditions for every moment of the day.

These instruments recorded accurately the following phenomena:

Temperature,
Barometric pressure,
Humidity of atmosphere,
Rainfall,
Direction of wind and
Velocity of wind.

The precipitation other than in the form of rain cannot be correctly recorded, and must be determined manually.

The instruments will run and make their written records without attention for six weeks, when they must be readjusted and the record sheets changed.

To reach the observatory and make the observations and changes necessary is an arduous task. It requires men expert in the use of snow shoes and inured to hardships. It requires more than a day to climb from the foot of the mountain to the observatory, a camp being made about an hour and a half's travel from the summit where a dugout is provided stored with food, bedding and fuel in ratproof containers.

After adjusting the instruments and putting everything in shape the observer requires only about two hours on skis to make the descent to the foot of the mountain.

While at the summit the observer makes determinations of the water content of the snow, which gives a true measurement of the precipitation not measured by the rain gages.

For several years Professor Church, largely at his own expense, made periodical trips to the Mount Rose observatory winter and summer and thus accumulated a large amount of valuable data.

When the Department of Engineering took up the study of snowfall and runoff it was found that no instruments of the kind needed could be had. Indeed, the apparatus for measuring the water in the snow had been developed by Professor Church and none were in existence excepting those manufactured for him.

Fortunately the state was able to procure all of the equipment used by him and also engaged his services, which were valuable in having the observations continued without a break, and also in training members of the Department's staff in the technique of making observations.

The acquisition of the equipment, which was the property of the University of Nevada, enabled the Department to make observations in a few snow basins in the winter of 1918-19 and extended the field somewhat, but it was extremely difficult to obtain additional apparatus.

Only recently, after nearly two years effort and through the assistance of Professor Church, the Department has accumulated sufficient apparatus to enable the investigations to be extended to several of the most important stream basins.

It was the theory of the Department, set forth in previous reports and appeals for financial aid, that after a few years' observation in a given watershed it would be able to forecast early in the season with reasonable accuracy the quantity of water that would flow in the stream later in the season.

It is held that eventually reservoirs will be built wherever available sites are found, which could be used for both flood control and irrigation if reliable information were available as to the quantity of water held in reservoir by the snow. In the absence of that information the irrigator will demand that the reservoirs shall be filled with the first water

that comes, for if held empty on the chance of high water later there may not be enough to fill the reservoirs for his use.

On the other hand, those whose lands are subject to injury from floods will contend that the reservoirs must not be filled until the danger of floods is past, else when the flood does arrive there will be no storage space for it.

With definite information as to the quantity of water being held in reserve by the snow fields it will be known in advance when it will be safe to fill the reservoirs.

Another great service to be obtained from advance information will inure to the irrigator who has not sufficient storage and must depend upon summer flow of water.

If he knows in the spring that the snow will furnish insufficient summer water he will not plant crops requiring late irrigation.

The studies so far conducted have enabled a start to be made in forecasting, and though the data has not been as complete as it will be when the system becomes fully developed, the close agreement of the prognostication with the measured runoff in the instances attempted, has been very gratifying.

The data obtained from the recording instruments at the observatories give information as to meteorological conditions preceding and during the accumulation of snow.

From those records it is known whether the ground was primed with water before the snow fell, or whether it was dry and absorbent; whether it was frozen so as to resist the penetration of the water from melting snow.

The actual measuring of the water contained in the snow is a manual process entirely separate from gathering of meteorological data.

The instruments were developed by Professor Church and have been manufactured under his direction. No instrument-maker has taken up the manufacture of them, and to procure those needed by this department it was necessary to enlist the service of expert mechanics in widely separated places, each making a part.

The apparatus consists of several parts. To obtain a sample of snow a straight steel tube armed with a serrated annular cutting bit, of a peculiar pattern, is used. The bit is brazed or "sweated" into the hollow shaft (not screwed on) so that there is no joint to catch the snow. The tube is made up in sections for convenient transportation and handling, and screwed together to make lengths up to about 16 feet. The couplings are so made that the sections butt together in a smooth joint. The tube has narrow slots cut in the walls, on opposite sides, so as to break joints and not weaken the shaft. These slots serve as windows through which to observe the column of snow within, and through which to insert a tool for clearing out the snow. On the outside of the

tube is a gage etched in the metal graduated in inches measured from the edge of the cutter.

The inside surface of the tubes are machined and polished to a high degree, and in order to eliminate friction of the snow to the greatest degree the interior is varnished after being used.

The couplings are made as thin as consistent with the requisite strength and turned down to a featheredge at the ends so as to offer least resistance to penetrating the snow.

The sample of snow is obtained by forcing the tube to the bottom, to do which a heavy wrench is applied by which to turn the tube and upon which weight is applied to force it down. The rotary motion is necessary to cut through layers of "glace" or frozen snow. As the tube descends it cuts out a column of snow which rises inside.

When the bottom is reached the tube is taken up and weighed. The weight of the empty tube is known, and the scale is calibrated so as to express the net weight of the snow in inches of water instead of in ounces and pounds as ordinarily.

The scale is of the spring balance type, but more carefully constructed and calibrated than is the case with any stock scales found in the market. In addition to its delicate adjustment it must also be rugged enough to withstand the rough handling incident to its use and transportation.

A "snow survey" consists of selecting courses which seem to the operator typical of average conditions in the snow field, and taking many, sometimes hundreds of samples of snow, each of which is weighed for its water content. In a small field or one with uniform topography and exposure, one or a few courses will be sufficient, but in a broken and rugged country covered with timber a great many courses may be required to obtain a good "average."

The field of operations are in the high mountains remote from habitations, and the work is strenuous to an extreme degree. It requires men of good health, inured to hardships, endowed with sound judgment, unyielding determination, possessing a good knowledge of woodcraft and acquaintance with the geography of the country.

In the absence of refuges stocked with the necessities, the operator must, in addition to his instruments, carry food and bedding to enable him to camp overnight if not able to return to his quarters. These considerations require the instruments to be made as light as possible and yet strong to withstand hard knocks.

An accident to a man which might be trivial elsewhere in these remote regions becomes a momentous matter, and if the injury is serious and he be alone, or overtaken by storms, which occur with suddenness, death is almost certain. It is therefore a rigid rule that no trip into dangerous territory shall be made by one alone, but always with a companion.

DAMS.

The law requires plans for dams which by their failure would endanger life or property shall be passed upon by the State Engineer. In pursuance of such provision the plans for the following dams have been approved during the past biennium:

Name	Owner	Location	Type	Height, feet
Misselbeck	Happy Valley Irrigation District	Shasta County.....	Hydraulic fill.....	100
Hoover Tunnel.....	Happy Valley Irrigation District	Shasta County.....	Arch, concrete.....	71
Saddlebag	Nevada-California Power Company	Mono County.....	Rock fill	45
Fish Slough.....	.....	Inyo County.....	Earth fill	85
Pine Hills	Volcan Water Company.....	San Diego County.....	Earth fill	25
Don Pedro	Turlock-Modesto Irriga- tion Districts.....	Tuolumne River.....	Arch, concrete.....	290
San Clemente	Del Monte Properties.....	Carmel River.....	Arch, concrete.....	90
Alvord	Riverside Water Company.	Riverside County	Earth, fill	25
Lee Lake.....	Temescal Water Company.	Riverside County	Earth fill	34

APPENDIX A—FINANCIAL SUMMARY.

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 to JUNE 30, 1920.

Chapter and year	Name of job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
RIVERS.				
377, 1917	Rectifying river channels.....	\$31,582 62	\$39,582 62	
377, 1917	Rectifying river channels, available 7/1/18.....	100,000 00	100,000 00	
469, 1919	Rectifying river channels, available 7/1/19.....	175,000 00	54 787 59	\$120,212 41
697, 1915	San Rafael deep water channel.....	12,500 00	12,500 00	
25, 1911	Sacramento River flood control.....	29 86		29 86
503, 1909	Humboldt Bay survey.....	499 43		499 46
526, 1911	Mad River bank protection.....	5,280 12	2,234 20	3,045 92
14, 1901	Restraining debris.....	42,068 91	1,109 00	40,968 91
742, 1911	Canals and canalization of rivers.....	3 47		3 47
502, 1911	Fel River bank protection.....	50		50
AGRICULTURAL PARK.				
572, 1919	Repairs to buildings and equipment.....	15 0 0 00	12 014 57	3,011 87
591, 1919	Improvement of grounds.....	10,000 00	3,566 42	6,433 58
443, 1913	Barns and poultry buildings.....	497 08	497 08	
534, 1911	Dairy buildings and barns.....	176 43	168 79	7 84
512, 1913	Drainage and sewers.....	11 39	2 09	9 30
532, 1911	Grandstand.....	16 22	16 22	
531, 1911	Manufacturers' pavillion.....	263 33	263 33	
533, 1911	Infield, walks and improvements.....	1 9 82	189 82	
281, 1911	Improvements to grounds.....	197 88	197 88	
280, 1917	Construction and repairs to buildings.....	3,302 64	3,294 84	7 80
71, 1909	Machinery Hall.....	21 02	21 02	
775, 1917	Construction Agricultural Pavilion.....	266,766 25	266,760 79	5 46
221, 1915	Construction and repairs, barns and sheds.....	72 58	72 58	
Cont. 5949, 5122	Sewer, water, spur track.....	759 70	759 70	
468, 1913	Armory, Los Angeles.....	548 72	46 45	502 27
469, 1913	Armory, Sacramento.....	995 40	978 19	17 21
238, 1915	Armory, Naval Militia, San Diego.....	306 18		306 18
310, 1917	Armory, Naval Militia, San Diego.....	800 00		800 00
321, 1915	Armory, Stockton.....	106 42		106 02
SCHOOLS.				
<i>California Polytechnic.</i>				
315, 1917	Construction of barn.....	4,0 0 0 00	5 00	3,995 00
511, 1907	Construction of barn.....	22		22
207, 1911	Dining hall.....	96 64		96 64
271, 1911	Heating system.....	4 81		4 81
493, 1913	Heating system.....	10 00		10 00
270, 1911	Power, heat and light.....	21		21
291, 1915	Repairs to building.....	49 10	43 62	5 48
548, 1911	Repairs and improvements.....	2 63		2 63
492, 1913	Repairs to buildings.....	143 62		143 62
471, 1917	Repairs to buildings.....	171 61	155 21	16 40
102, 1913	Water system.....	293 46		293 46
290, 1915	Water supply.....	11,137 53	10,983 16	144 37
228, 1911	Water and sewer system.....	1 19		1 19
358, 1917	Repairs, Emergency Fund.....	3,500 00	3,494 65	5 35
445, 1919	Repairs, improvements and equipment.....	10,000 00	9 970 35	29 65
<i>Chico State Normal.</i>				
173, 1913	Repairs and addition to heating system.....	79 07		79 07
224, 1915	Repairs and improvements.....	55 73		55 73
460, 1913	Repairs and alterations.....	76		76
282, 1917	Additions to Training Building.....	8,054 16	7,815 05	239 11
459, 1913	Water supply.....	26 39	6 00	20 39
136, 1911	Passageway.....	25 31		25 31
536, 1913	Street work.....	75 70		75 70
559, 1919	Trade School unit.....	32,000 00	7,488 32	24,511 68
558, 1919	Repairs to buildings and equipment.....	6,000 00	5,361 19	638 81
557, 1919	Development and equipment of water supply.....	10,000 00	5,515 14	4,484 86

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 TO JUNE 30, 1920—Contd.

Chapter and year	Name of job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
<i>Fresno Normal.</i>				
207, 1915	Grounds -----	416 18	-----	416 18
504, 1911	Grounds -----	1,576 97	-----	1,576 97
240, 1917	Completion of plant and equipment-----	5,290 71	5,272 77	17 94
171, 1913	Temporary buildings -----	101 12	-----	101 12
393, 1915	Clock system -----	113 05	-----	113 05
516, 1913	Building and equipment -----	36 41	-----	36 41
303, 1917	Claims of contractors -----	7,611 04	12 20	7,598 84
436, 1919	Repairs, improvement and equipment-----	5,700 00	1,632 27	4,037 73
239, 1917	Care and improvement of grounds-----	3,600 00	3,600 00	-----
<i>Humboldt Normal.</i>				
204, 1915	Construction and equipment -----	4 42	-----	4 42
408, 1919	Painting buildings -----	650 00	559 11	90 89
743, 1917	Construction buildings, sidewalks, sewers and grading -----	219,940 48	93,192 82	126,747 66
237, 1917	Painting temporary buildings -----	39	-----	39
742, 1917	Equipment and furnishings -----	14,000 00	-----	14,000 00
<i>Los Angeles State Normal.</i>				
335, 1917	Addition to buildings -----	4,509 99	4,509 99	-----
332, 1915	Addition to Manual Training Building-----	2 31	2 31	-----
416, 1911	Building and Improvement Fund-----	3 32	3 32	-----
504, 1913	Bleacher and playground equipment-----	196 95	196 95	-----
340, 1917	Improvement to grounds -----	9,750 00	9,750 00	-----
334, 1917	Repairs to buildings and equipment-----	418 31	418 31	-----
Cont. 1006	Completion of roads and walks-----	810 51	809 94	57
<i>Preston School of Industry.</i>				
400, 1919	Repairs, improvements, equipment -----	57,000 00	13,877 34	43,122 66
156, 1909	Cottage No. 2 -----	581 95	-----	581 95
172, 1913	Cottages -----	377 24	312 66	64 58
529, 1913	Hospital -----	10,744 99	10,065 32	679 67
549, 1911	Concrete floor -----	702 43	-----	702 43
301, 1915	Repairs -----	1,122 41	833 20	239 21
690, 1911	Repairs -----	1 04	-----	1 04
411, 1917	Repairs and improvements -----	6,325 48	6,251 86	73 62
522, 1907	Pipe line -----	2 21	-----	2 21
531, 1913	Addition to Trades Building-----	10,616 40	-----	10,616 40
195, 1911	Water system -----	555 26	420 17	135 09
206, 1911	Water power plant -----	6 33	-----	6 33
Cont. 3856	Club house -----	3 69	3 69	-----
<i>San Diego Normal.</i>				
246, 1917	Improvement to grounds -----	247 22	238 03	9 19
236, 1915	Grounds -----	01	-----	01
491, 1913	Improvements to grounds-----	10	-----	10
524, 1911	Heating plant -----	18 99	17 22	1 77
308, 1917	Paving -----	1,469 56	-----	1,469 56
333, 1917	Repairs and improvements-----	297 18	296 89	29
234, 1915	Repairs and improvements-----	46	-----	46
490, 1913	Repairs and improvements-----	11	-----	11
411, 1919	Repairs and improvements to buildings and equipment -----	3,000 00	2,947 90	52 10
461, 1919	Improvement to grounds and equipment-----	1,500 00	1,450 67	49 33
<i>San Francisco State Normal.</i>				
395, 1919	Repairs to buildings and equipment-----	5,000 00	5,000 00	-----
491, 1917	Buildings -----	450,000 00	-----	450,000 00
123, 1911	Repairs -----	02	-----	02
225, 1915	Remodeling buildings -----	25 90	-----	25 90
Cont. 1302	Repairs -----	1 57	-----	1 57

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 TO JUNE 30, 1920—Contd.

Chapter and year	Name of job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
<i>San Jose State Normal.</i>				
219, 1915	Outdoor classrooms	60 38		60 38
463, 1913	Gymnasium and playgrounds.....	13 22		13 22
426, 1913	Repairs	185 54		185 54
258, 1917	Assembly Hall	79,215 54	77,687 22	1,528 32
243, 1915	Street improvements	9,373 42	9,373 42	
193, 1911	Grounds	133 43		133 43
391, 1919	Improvements to heating plant.....	710 60	543 74	166 26
476, 1919	Repairs, improvements and equipment....	9,373 42	2,746 36	6,627 06
<i>Santa Barbara State Normal.</i>				
451, 1919	Repairs, improvements and equipment....	6,500 00	6,481 89	18 11
295, 1915	Grounds	02		02
237, 1917	Gymnasium	11,759 35	11,746 14	13 21
299, 1915	Machinery Building	21 64		21 64
294, 1915	Repairs	31 57	31 50	07
546, 1911	Main Building	8 56		8 56
647, 1911	Lunch room	56		56
250, 1917	Sewer system	20 03		20 03
645, 1919	Emergency fund, repairs to roof.....	767 00	767 00	
<i>California School for Girls.</i>				
362, 1917	Trades Building and Gymnasium.....	29,610 85	29,627 65	13 20
367, 1917	Cottages	62,365 69	62,292 84	72 85
365, 1917	Heating system	209 34	192 05	17 29
366, 1917	Improvement of grounds	1,229 14	1,211 24	17 90
361, 1917	Ice plant	257 15	256 25	1 90
364, 1917	Service connections	6,000 00	5,911 84	88 16
474, 1917	Water system	9,966 05	9,962 64	3 41
239, 1915	Commissary Building	145 96	143 02	2 94
318, 1915	Two cottages	4 75		4 75
241, 1915	Cottages for males	3 53		3 53
262, 1915	Drains	2 32		2 32
240, 1915	Farm buildings	48 14	48 14	
319, 1915	Garage	23 59	23 59	
320, 1915	Grounds	32 81	32 81	
401, 1913	Construction and equipment	616 03	576 83	39 20
388, 1919	Construction of cottages	90,000 00	3,525 72	86,474 28
389, 1919	Farm buildings	5,000 00	4,950 30	49 70
569, 1919	Improvement to grounds	5,000 00	4,909 07	90 93
584, 1919	Completion of cottage unit.....	20,000 00	333 02	19,666 98
Support fund	Completion of work around building and grounds	1,100 00	1,098 23	1 77
6555, 1920	Repairs sup- port fund			
Support fund	Alterations to no privilege cottage	1,769 27	1,768 80	47
est. 2650	Alterations to hospital building.....	2,400 00	2,387 98	12 02
Cont. 1:20	Alterations on no privilege cottage.....	630 73	623 73	7 00
360, 1917	Equipment of Trades Building	8,000 00		8,000 00
<i>Whittier State School.</i>				
500, 1919	Repairs and improvements	28,500 00	25,348 87	3,151 13
629, 1919	Construction of buildings	64,000 00	40,747 21	23,252 79
316, 1917	Buildings	36,236 21	35,323 89	912 32
238, 1915	Cottages	69 36	34 48	34 88
233, 1911	Dairy barn	13 20	13 20	
355, 1917	Power house	24,112 16	24,059 28	52 88
359, 1917	General repairs and improvements.....	39 31	39 31	
357, 1917	Alterations and construction	22,204 41	22,156 91	47 50
317, 1915	General repairs and improvements.....	3 15	3 15	
232, 1911	Repiping	1 23	1 23	
Cont. #4837	Miscellaneous improvements	71,000 00	1,766 47	69,233 53
Cont. #1059	Construction refrigerator plant.....	2,000 00	1,553 64	446 36
Cont. #3605	Drilling well	5,300 00		5,300 00
Est. sup. #4542	Hot water tank	500 00	481 58	18 42

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 TO JUNE 30, 1920—Contd.

Chapter and year	Name of job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
HOMES.				
<i>Berkley School for Deaf and Blind.</i>				
384, 1919	Repairs and improvements.....	8,697 00	8,697 00	-----
348, 1917	Repairs and improvements.....	5,987 49	5,987 49	-----
293, 1917	Completion heating plant.....	5,454 22	3,261 61	2,192 61
294, 1917	Wiring	28 18	24 43	3 75
247, 1915	Repairs	1 28	1 23	05
248, 1915	Electric wiring	30 10	17 82	12 28
249, 1915	Fire escapes	25 70	-----	25 70
250, 1915	Development of wells.....	413 06	-----	413 06
251, 1915	Repairs and improvements.....	6 31	-----	6 31
277, 1915	Heating system	136 75	14 78	121 97
442, 1913	Dairy barn	17 53	-----	17 53
440, 1913	Gymnasium	231 14	-----	231 14
514, 1913	Repairs and improvements.....	43 79	41 80	1 99
655, 1911	Manual industrial arts building.....	270 06	-----	270 06
523, 1911	Water supply	8 80	-----	8 80
509, 1909	Plumbing, etc.	2 64	-----	2 64
<i>Oakland Blind Home.</i>				
446, 1919	Repairs	4,500 00	4,496 20	3 80
288, 1917	Grounds improvements	19 04	5 50	13 54
289, 1917	Water supply	1,251 53	988 10	268 43
292, 1917	Repairs	214 54	214 11	43
245, 1915	Repairs	4 65	1 94	2 71
418, 1913	Dormitory	311 83	41 50	270 33
419, 1913	Floors in shops.....	102 68	-----	102 68
<i>Sonoma State Home.</i>				
624, 1919	Cottage	24,000 00	23,248 61	751 39
380, 1919	Sewers and drains.....	26,000 00	22,451 84	3,548 16
432, 1919	Water supply	90,000 00	861 53	89,138 47
264, 1917	Cottage	8,838 44	8,829 25	4 19
265, 1917	Bakery	13,576 49	13,576 49	-----
351, 1917	Steam piping	64 73	12 15	52 58
352, 1917	Reflooring	1,382 03	1,361 50	20 56
353, 1917	Reconstruction Madrone Hall.....	5,009 00	2,541 71	2,458 29
208, 1915	Barracks	91 97	90 69	1 28
297, 1915	Water and steam piping.....	7 98	-----	7 98
508, 1913	Cottage	10 30	2 52	7 78
435, 1913	Dormitory	10 04	-----	10 04
509, 1913	Farm buildings	156 55	-----	156 55
436, 1913	Nursery for males.....	133 23	-----	133 23
434, 1913	Septic tank	1 78	-----	1 78
433, 1913	Water supply	997 54	516 93	480 61
519, 1911	Reflooring	62 88	57 53	5 35
448, 1909	Repairs Manor House.....	4 98	-----	4 98
568, 1909	Power house and boiler.....	28 26	-----	28 26
Cont. est. 2690	Garage	3,400 00	3,343 26	56 74
266, 1917	Laundry and equipment.....	19,499 74	19,499 74	-----
Cont. est.				
7524-B	Pole line	407 00	407 00	-----
Cont. est.				
7524-A	Service connections	2,200 00	2,200 00	-----
<i>Veterans' Home.</i>				
442, 1919	Repairs and improvements.....	52,500 00	32,708 10	19,791 90
483, 1917	Boilers	15,000 00	2,532 41	12,467 59
395, 1917	Chapel	814 45	814 45	-----
391, 1917	Wiring	1,485 12	1,412 41	72 71
394, 1917	Quarters for inebriates.....	4,008 18	4,008 18	-----
426, 1917	Kitchen and equipment.....	2,693 20	2,015 14	678 06
244, 1917	Painting	7,500 00	7,302 20	196 80
392, 1917	Plumbing	2,500 00	2,499 00	1 00

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 TO JUNE 30, 1920—Contd.

Chapter and year	Name of Job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
<i>Veterans Home—Continued.</i>				
263, 1917	Repairs	8,003 38	8,808 47	96 61
243, 1917	Tubercular ward	6,530 68	6,525 29	5 39
214, 1915	Baths	63 99	63 99	-----
216, 1915	Electric wiring	50 15	48 25	1 90
215, 1915	Plumbing	4,569 31	4,228 16	340 15
213, 1915	Repairs	225 81	220 00	5 81
483, 1913	Assembly hall	95 57	-----	95 57
484, 1913	Dairy barn	43 09	42 88	21
409, 1913	Lavatories	24 65	-----	24 65
410, 1913	Painting	6 33	-----	6 33
470, 1913	Pipe line	397 43	335 20	62 23
482, 1913	Plumbing	3 48	3 00	48
411, 1913	Repairs	76 75	75 56	1 19
235, 1911	Cold storage	21 71	-----	21 71
511, 1911	Cottage C	101 37	101 37	-----
236, 1911	Fire escapes	255 63	-----	255 63
508, 1911	Grounds, etc.	102 91	101 87	1 04
507, 1911	Plumbing	12 63	11 25	1 38
521, 1911	Septic tanks	837 74	3 06	534 68
510, 1911	Surgeon's residence	66 07	66 07	-----
252, 1909	Distilling water	52 97	48 12	4 85
488, 1909	Store house	108 20	106 38	1 82
<i>Women's Relief Corps Home.</i>				
466, 1919	Repairs	1,200 00	1,200 00	-----
248, 1917	Repairs	1,282 79	1,282 79	-----
<i>HOSPITALS.</i>				
<i>Agnews State Hospital.</i>				
568, 1919	Cottages	22,000 00	1,182 11	20,817 89
402, 1919	Heating plant and improvements	3,500 00	2,550 86	949 14
307, 1917	Cottage	25,339 80	25,336 79	3 01
332, 1917	Workers' cottage	42,314 93	42,299 15	15 78
754, 1915	Cottage	285 75	7 18	278 57
400, 1913	Cottage	5,449 35	340 79	5,108 56
473, 1913	Nurses' home	1,912 27	-----	1,912 27
606, 1913	Wiring and steam lines	38 34	38 34	-----
Cont. 6347	Pumping plant	1,800 00	1,800 00	-----
Cont. 9810	Repairs to administration building	500 00	500 00	-----
Cont. 2170	Heating system	5,000 00	5,000 00	-----
Cont. 11022	Miscellaneous improvements	500 00	500 00	-----
<i>Mendocino State Hospital.</i>				
403, 1919	Reconstruction Ward No. 7	5,000 00	5,000 00	-----
404, 1919	Sundry improvements	5,000 00	1,596 00	3,404 00
443, 1919	Heating system	5,700 00	5,633 76	66 24
444, 1919	Shelters for women patients	5,000 00	4,021 27	978 73
267, 1917	Water softening	7,425 86	7,403 75	22 11
168, 1917	Reconstruction Ward No. 7	4,639 65	4,570 82	118 83
325, 1917	Plumbing repairs	4,787 54	4,539 54	178 00
326, 1917	Operating room	3,000 00	2,352 00	648 00
327, 1917	Reconstruction Ward No. 10	8,452 00	8,446 67	5 33
370, 1917	Boilers, etc	11,141 80	11,033 01	108 79
371, 1917	Repairs administration building	2,016 20	1,947 35	68 85
192, 1915	Pipe line	692 45	547 59	144 86
305, 1915	Plumbing repairs	32 36	-----	32 36
107, 1913	Dam and reservoir	3,042 91	-----	3,042 91
481, 1913	Gas plant	3 90	-----	3 90
125, 1911	Male cottage	258 22	258 22	-----
267, 1917	Repairs flooring	685 00	685 00	-----
296, 1917	Laundry and bakery	1,582 70	1,582 70	-----
Cont. 2953	Fences, shelters, etc.	1,750 00	427 41	1,322 59
Cont. 8245	Tank tower	1,000 00	991 75	8 25
Cont. 5640	Water supply	6,850 18	6,734 18	116 00
Cont. 1058	Substation transmission lines, etc.	2,175 21	-----	2,175 21

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 TO JUNE 30, 1920—Contd.

Chapter and year	Name of job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
<i>Napa State Hospital.</i>				
565, 1919	Quarters for employes.....	50,000 00	-----	50,000 00
397, 1919	Heating system, improvements.....	2,500 00	1,147 15	1,352 85
242, 1917	Pathological laboratory	19,301 34	205 55	19,095 79
397, 1917	Power house	923 35	923 35	-----
398, 1917	Electric elevators	118 37	82 67	35 70
399, 1917	Sewers	591 35	583 69	7 66
410, 1917	Reclamation and irrigation, low lands.....	3,243 83	3,225 87	18 01
241, 1917	Cottages	14,883 83	14,880 59	3 24
480, 1917	Cottages	57,417 25	57,351 54	65 71
789, 1917	Water supply	27,084 54	26,759 69	324 85
352, 1915	Power house	33 09	32 50	59
324, 1915	Cottage	9 34	-----	9 34
Cont. 10083	Electrical installation	600 00	600 00	-----
Cont. 8150	Completion convalescent cottage.....	2,500 00	2,500 00	-----
487, 1913	Dairy building	451 51	10 00	441 51
486, 1913	Dormitories	146 87	-----	146 87
408, 1913	Heating system	152 70	66 05	86 65
405, 1913	Laundry	252 01	-----	252 01
404, 1913	North pay cottage.....	46 95	-----	46 95
488, 1913	Rewiring	73 72	73 21	51
489, 1913	Reclamation low lands.....	71 04	70 23	76
506, 1911	Cold storage	49 99	-----	49 99
505, 1911	Irrigation	4 54	-----	4 54
489, 1909	Cottage	319 48	-----	319 48
314, 1909	Kitchen	51 99	-----	51 99
315, 1909	Receiving building	34 83	-----	34 83
Cont. 2838	Power line	850 00	35 56	814 44
<i>Norwalk State Hospital.</i>				
588, 1919	Officers' quarters and diningroom.....	45,000 00	2,040 00	42,960 00
587, 1919	Cottages	150,000 00	1,022 29	148,977 71
588, 1919	Improvements on farm.....	5,000 00	3,006 23	1,993 72
585, 1919	Water tower, etc.....	20,000 00	91 07	19,908 93
343, 1917	Superintendent's cottage	8,594 83	8,579 65	15 18
344, 1917	Farm buildings	36,700 00	32,750 00	3,950 00
345, 1917	Construction administration building.....	49,747 92	6,714 19	43,033 73
346, 1917	Three cottages	114,156 15	114,105 05	51 10
455, 1913	Buildings, etc.....	330 86	320 90	9 96
237, 1915	Buildings, etc.....	151 00	116 65	34 35
341, 1917	Bakery equipment	4,000 00	4,000 00	-----
Cont. 5902	Pumping plant	5,150 00	5,150 00	-----
Cont. 7644	Power line	700 00	700 00	-----
Cont. 10512	Completion of Sup't. residence.....	1,150 00	1,117 66	32 34
<i>Southern California State Hospital</i>				
440, 1919	Heating plant	5,850 00	4,295 42	1,554 58
336, 1917	Boilers	7,908 47	7,890 08	9 39
337, 1917	Wiring old buildings and grounds.....	2,945 28	2,945 28	-----
338, 1917	Cottage—disturbed patients	17,423 62	17,419 49	4 13
330, 1917	Pump, motor, etc.....	29 57	8 12	20 45
404, 1917	Nurses' home	2,900 52	2,153 08	147 47
477, 1913	Four cottages	771 85	-----	771 85
461, 1909	Physicians' cottage	2 16	-----	2 16
462, 1909	Dining hall	244 27	-----	244 27
457, 1909	Female cottage No. 2.....	17 00	-----	17 00
459, 1909	Female cottage No. 3.....	50 90	-----	50 90
135, 1907	Dairy barn	135 10	-----	135 10
490, 1913	Laundry	8 51	-----	8 51
466, 1909	Cottages	65 64	-----	65 64
281, 1911	Power plant	107 70	-----	107 70
497, 1913	Reservoir	208 88	-----	208 88
458, 1909	Storm drains	274 71	-----	274 71
307, 1915	Water supply	57 81	57 81	-----
Cont. est. #6186	Roofing	3,000 00	2,953 80	46 20

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 TO JUNE 30, 1920—Contd.

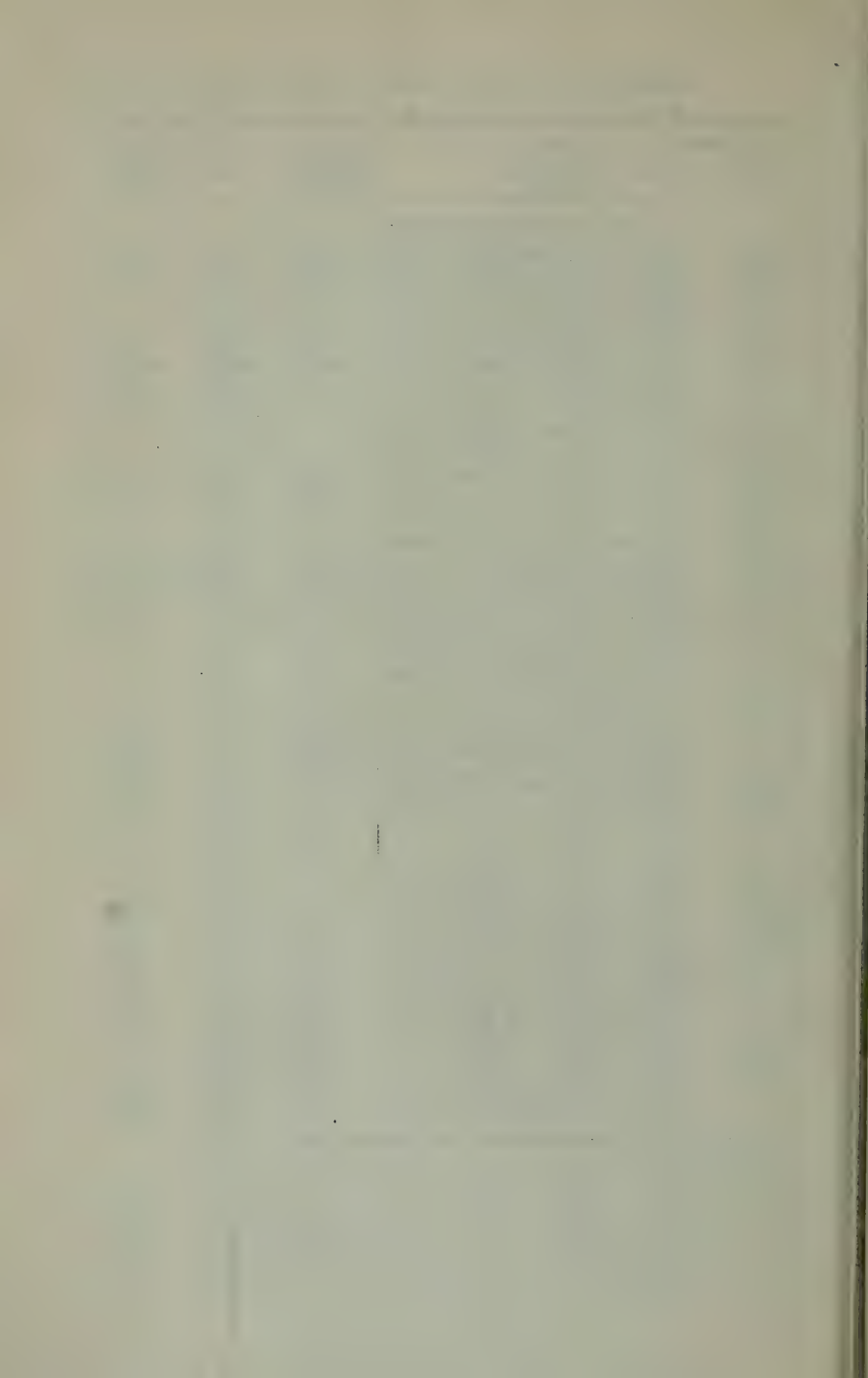
Chapter and year	Name of job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
<i>Stockton State Hospital.</i>				
601, 1919	Cottage	50,000 00	2,295 90	47,704 10
437, 1919	Heating plant improvements	2,850 00	262 06	2,587 94
394, 1919	Completion tubercular hospital	9,500 00	9,151 84	348 16
398, 1919	Sewer system	15,000 00	102 63	14,897 37
309, 1919	Repairs	12,000 00	11,603 09	396 91
272, 1917	Tubercular hospital	9,983 79	9,986 79	5 19
330, 1917	Cottage disturbed patients	44,979 25	44,767 41	211 84
414, 1913	Elevators	86 00		86 09
127, 1911	Fire system	422 69	410 95	11 74
197, 1911	Heating system	54 22	51 44	2 78
172, 1907	Receiving ward	18 84		18 81
126, 1911	Sewing room	245 98	243 02	2 36
416, 1913	Ward 25	490 00	131 76	268 14
211, 1915	Boilers	244 59	57 49	187 10
310, 1915	Convalescent building	566 49	549 36	17 13
310, 1915	Cottage for males	56 88	39 25	17 63
300, 1915	Farm buildings	757 22	750 64	6 58
234, 1917	Repairs and additions	207 04	205 37	1 67
235, 1917	Kitchen and baking alterations	241 78	241 78	
Cont. est.	Painting tower tank	700 00	603 90	96 10
Cont. est. #2379	Repairs water storage tank	350 00	336 10	13 90
Cont. est. #9535	Main sewer	10,000 00	9,581 93	418 07
Cont. est. #331	Steam and water supply systems	1,289 05	1,277 88	2 17
792, 1917	Crematory	4,968 33	4,968 33	
415, 1913	Heating system	83 21	83 21	
<i>Pacific Colony.</i>				
562, 1919	Buildings	100,030 00	36,007 69	63,992 31
<i>PRISONS.</i>				
<i>Folsom State Prison.</i>				
422, 1919	Machine and blacksmith shop	1,500 00		1,500 00
396, 1919	Electrical equipment	4,000 00		4,000 00
467, 1919	Repairs	10,000 00	3,247 90	6,752 10
276, 1917	School building	6,974 09	5,851 46	1,122 63
278, 1917	Repairs	16,281 52	16,250 45	31 07
485, 1917	Boilers, etc.	9,009 12	9,009 12	
273, 1915	Cells, etc.	53 50	53 50	
448, 1913	Repairs	132 07	132 07	
449, 1913	Repairs and walls	4,479 93	4,297 57	182 36
313, 1915	Bake oven	1,572 61	1,527 80	44 81
254, 1917	Sewage disposal	1,244 24	1,210 76	3 48
312, 1915	Refrigerator	274 32	274 32	
447, 1913	Farm buildings	482 20	482 20	
562, 1909	Warden's residence	216 63	216 63	
279, 1917	Cottage (employees)	852 99	852 99	
279, 1917	Cottage repairs	1,752 54	1,752 54	
311, 1915	Farm building	24 93	24 93	
215, 1915	Electric power house	229 65	229 65	
573, 1909	Additional houses	138 64	138 64	
450, 1915	Laundry	170 07	170 07	
598, 1903	Boiler for kitchen	51 35	51 35	
316, 1915	Repairs	7 03	7 03	
<i>San Quentin Prison.</i>				
401, 1919	Electrical installation	6,650 00	4,258 24	2,391 76
233, 1917	Rewiring	9,697 07	8,670 39	1,026 68
263, 1917	Rewiring	99 67	34 34	65 33
284, 1917	Small buildings	10,242 63	10,203 34	37 29
285, 1917	Additional farm buildings	5,000 00		5,000 00
559, 1909	Guards' cottages	83 32		83 32
228, 1915	Water supply	4,111 83		4,111 83
562, 1911	Cells and walls	3,130 66	3,126 01	4 65

EXPENDITURES ON APPROPRIATIONS JULY 1, 1918 TO JUNE 30, 1920—Contd.

Chapter and year	Name of job	Balance July 1, 1918, and appropriations	Expended	Balance June 30, 1920
	<i>San Quentin Prison—Continued.</i>			
358, 1917	Department of Engineering, contingent sixty-ninth year	7,180 50	840 84	*6,339 66
	Balance from sixty-ninth year	6,339 66		
358, 1917	Department of Engineering, seventieth year	22,500 00		
645, 1910	Department of Engineering, contingent sixty-ninth year	\$28,839 66	\$20,322 51	†8,517 15
		20,000 00	17,742 00	2,258 00
	CAPITOL BUILDING.			
Emergency fund				
645, 1919	Repairs trusses, Capitol building	4,500 00	2,543 00	1,956 91
Board of Control support				
645, 1919	Alterations of Board of Control rooms			
868, 1917	Painting Capitol building	1,650 00	1,453 78	196 22
762, 1917	Construction printing office	1,824 43	1,795 58	28 85
532, 1913	State Capitol Conservatory	100,000 00		100,000 00
538, 1913	State Capitol elevators	45 73		45 73
354, 1917	Repairs heating system and elevators	34 85		34 85
354, 1917	Doors, etc., Sixth District Agricultural Association building	2,302 15	2,302 15	
354, 1917	Remodel Sixth District Agricultural Association building	207 00	207 00	
430, 1917	Vault, Secretary of State's office	11,897 14	11,897 14	
618, 1919	San Francisco State Building	849 60	160 30	687 30
	San Francisco State Building Fund	350,000 00		350,000 00
	Sacramento State Building Fund	978,408 70	165,058 30	813,350 40
619, 1919	Sacramento State Building	140,000 00	133,449 52	6,550 48
645, 1919	Emergency fund, repairs Governor's residence	300,000 00		300,000 00
400, 1917	Marshalls monument	950 00	950 00	
		2,667 69	3,663 77	3 92
	MISCELLANEOUS.			
321, 1917	Repairing Custom House, Monterey			
311, 1917	Fort Ross, repairs to buildings	551 40	394 55	186 85
679, 1915	Fort Ross, repairs to buildings	1,368 50	310 22	1,058 28
322, 1911	Mission San Francisco de Solano, Sonoma	24 61		24 61
480, 1913	Mission San Francisco de Solano, Sonoma	109 84		109 84
693, 1915	Mission San Francisco de Solano, Sonoma	952 36	57 75	894 61
759, 1917	Petroleum and gas fund building	102 12		102 12
759, 1917	Petroleum and gas fund building	386 47	386 47	
358, 1917	Repairs, Governor's residence	1,384 44		1,384 44
438, 1919	Purchasing department support alterations	2,182 24	2,182 24	
		890 00	890 00	
458, 1919	Frommer building alterations	4,000 00	4,000 00	
458, 1919	Frommer building heating system	1,800 00	1,800 00	
	Fish and game preservation fund, Lake Tahoe fish hatchery	27,300 00	9,990 00	17,310 00

*Balance seventieth year.

†To general fund.



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REPORT

BY

State Civil Service Commission

AND

State Board of Control

TO

THE SENATE AND THE ASSEMBLY

RELATIVE TO

Names, Titles, and Salaries of State
Officers and Employees

February 25, 1921



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1921

LETTER OF TRANSMITTAL.

STATE BOARD OF CONTROL.

SACRAMENTO, CALIFORNIA, March 3, 1921.

Assembly of the State of California, Sacramento, California.

GENTLEMEN: Pursuant to the instructions contained in Assembly Concurrent Resolution No. 9, adopted January 14, we submit herewith a complete report of the names of all the officers and employees in each and every office, department, board, bureau, commission and institution of the government of the State of California, with their titles and their monthly salaries or wages, all as of January 1, 1921. Also is given a statement showing the number of persons engaged for temporary or emergency work during the fiscal year ending June 30, 1921, and the total amount expended therefor.

As a part of the report we are preparing the following four summaries which will show the totals of the monthly and yearly expenditures for salaries and wages as of January 1, 1921, of all the State agencies, the first of which summaries accompanies this report:

- (1) All those agencies which appear in the general appropriation bill.
- (2) The self-supporting agencies.
- (3) State Highway Commission, which is financed entirely by bond issues and motor vehicle tax funds.
- (4) University of California, which is supported partly by State appropriations and partly by endowment funds and other income. (The University payroll submitted in the report is the entire payroll, paid partly by the State and partly by endowment funds and other income.)

In these summaries nineteen salary groups have been set up, showing for each agency the number of officers and employees that fall within each salary group. The lowest of these salary groups include those receiving \$75 or less per month, and the groups range in amounts up to \$861 to \$900 per month. The summaries will also show what percentage each group is of the whole number of employees.

Each of the four summaries will show the average monthly salary of all officers and employees as follows:

- (1) Departments appearing in the general appropriation bill, average monthly salary, \$131.35.
- (2) Self-supporting departments, average monthly salary, \$140.82.
- (3) Highway Commission, average monthly salary, \$135.67.
- (4) University of California, average monthly salary, \$134.48.

In addition to the salaries received, maintenance also is furnished to certain employees in hospitals, prisons, reformatories, institutions for feeble minded, Veterans' Home, institutions for the blind, Women's Relief Corps Home and certain field parties of the State Highway Commission.

Respectfully submitted.

STATE BOARD OF CONTROL.

S. P. ALLEN, Secretary.

STATE CIVIL SERVICE COMMISSION.

NOVA J. BEAL, Secretary.

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STATE BOARD OF ACCOUNTANCY.

311 California Street, San Francisco, California.

Name of Officer or Employee and Title	Monthly Salary or Daily Wage
John F. Forbes, President.....	\$5.00 a day*
Reynold E. Blight, Vice President.....	\$5.00 a day*
Prentiss Maslin, Member.....	\$5.00 a day*
B. W. Bours, Member.....	\$5.00 a day*
William Dolge, Secretary-Treasurer.....	\$5.00 a day*

EMERGENCY EMPLOYMENT.

B. Larkins, Assistant to Secretary.....	.75 cents an hour
---	-------------------

1919—		1920—	
July	\$18 18	January	\$29 25
August	29 44	February	18 13
September	14 81	March	7 31
October	37 13	April	46 13
November	16 31	May	35 06
December	24 94	June	9 94
		July	11 44
		August	52 31
		September	27 18
		October	51 50
		November	27 56
		December	

*Attending examinations (4 days each year) and attending meetings (3 or 4 each year).

THE ADJUTANT GENERAL'S OFFICE.

Form of report of officers and regular employees employed by this department on January 1, 1921:

Name of Officer or Employee and Position	Monthly Salary
Statutory employees—	
Brig. Genl. J. J. Borree, The Adjutant General.....	\$416 67
Lieut. Col. J. S. McKnight, Assistant Adjutant General.....	250 00
Howard S. McIntire, Chief Clerk.....	158 33
Jacob Alexander, Clerk.....	141 67
John E. Sherburn, Clerk.....	141 67
Clarissa E. Bowen, Clerk.....	141 67
Louise J. Bogert, Stenographer-Clerk.....	125 00
John L. Henderson, Military Storekeeper.....	100 00
Peter Rouning, Assistant Military Storekeeper.....	75 00
Non-Statutory Positions—	
James Wilson, Clerk.....	\$125 00
Harriet B. Bird, Stenographer-Clerk.....	110 00
Winnie Brown, Clerk.....	100 00
Melva T. Smith, Clerk.....	100 00
Charlotte Jensen, Stenographer.....	100 00
Adolph H. Griesel, Services (State Arsenal).....	90 00
Ethel D. Connelly, Typist.....	90 00
Edna F. Shaplin, Typist.....	90 00
Florence Wicks, Typist.....	90 00
Sam Vicari, Janitor.....	70 00
Richard J. Shaplin, Messenger.....	60 00
Total	\$2,575 01

Number of persons engaged for temporary employment, as Clerks, Stenographers, and Typists, in connection with compiling and completing State Military records and records pertaining to operation of Federal Selective Service Law in California, during fiscal year ended June 30, 1920.....	12
Total expenditure for salaries for same.....	\$7,595 33

ADVISORY PARDON BOARD OF CALIFORNIA.

Rooms 328-9 Mills Building, Telephone: Sutter 2311, San Francisco, California.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Advisory Pardon Board.

Name of Officer or Employee and Title	Monthly Salary
Frank L. Fenton, Secretary.....	\$150 00*
Miss G. Pursell, Stenographer and Typist.....	10 00†
Respectfully submitted: Advisory Pardon Board. By Frank L. Fenton, Secretary.	

*Statutory salary.

†Intermittent employment.

THE SIXTH DISTRICT AGRICULTURAL ASSOCIATION.

Report of officers and regular employees employed by this department on January 1, 1921.

Name of Officer or Employee and Title	Monthly Salary
W. N. Harris, Secretary (Building Manager).....	\$300 00
W. H. Fowler, Processor (Exhibit Expert).....	250 00
Vincent Cech, Cabinet Maker	175 00
A. H. Koch, Multicolor Operator and Processor's Assistant.....	150 00
Mary B. Trelease, Stenographer (Office Manager).....	150 00
J. A. Benston, Handyman	135 00
Minta Esterly, Information Bureau Clerk.....	115 00
Wm. G. Carbee, Janitor	105 00
C. R. Ransom, Janitor	105 00
Jos. T. Roadhouse, Janitor	105 00
Willard Gregory, Night Janitor (one-half time).....	52 50
Dewey A. Niles, Night Janitor (one-half time).....	52 50

Name of Temporary Employee and Title	Wage Per Day or Hour	Total Wages Received
Edouard A. Vysekai, Artist.....	\$6 00 and \$7 50	\$1,341 75
Geo. Feldcamp, Laborer	3 50 and 4 00	566 31
H. W. Powell, Carpenter	6 00	420 00
Ignace Vysekai, Artist	7 50	345 00
Calvin Aerick, Cabinet Maker	5 50	96 25
J. B. Ingraham, Carpenter	5 50	55 00
R. Udclowitz, Laborer	50 hr.	47 00
Douglas Greer, Laborer	50 hr.	38 50
John P. Lobkovich, Laborer	50 hr.	35 94
Lenoyne S. Bloom, Laborer	50 hr.	24 00
Donald J. Heintzelman, Laborer	50 hr.	24 00
W. S. Thorson, Laborer	50 hr.	15 25
Henry E. Curtis, Laborer	50 hr.	12 00
Adolf Kunz, Laborer	50 hr.	8 00
A. P. Kruchten, Laborer	50 hr.	6 00
Alfred Bustel, Laborer	50 hr.	3 50
Total.....		\$3,038 50

See attached sheet for work performed by each permanent employee.

Duties of Employees of Sixth District Agricultural Association.

The Board of Directors of the Sixth District Agricultural Association consists of the following business men, who serve the institution without salary:

Frank Simpson, President; W. H. Harrison, Vice President; R. W. Burnham, Clinton E. Miller, Standish L. Mitchell, E. W. Murphy, Walter P. Story, and Albert M. Paul, Manager.

Mr. Paul's service might properly be termed Consulting or Advising Manager. He visits the building at least once each week to discuss and advise in matters of importance, and is available by phone at all times. (No compensation received.)

W. N. Harris, Secretary, \$300 per month:

Mr. Harris's position is that of Secretary to the Board of Directors and manager of all departments of the State Exposition Building, the directing of publicity, the securing of exhibits, the creation and maintenance of relations between this institution and the different agencies in California that are working for promotion and state, county and municipal publicity.

Vincent Cech, Cabinet Maker, \$175 per month:

Mr. Cech's duties as cabinet maker include the building and entire finishing of exhibit cases, the cutting and fitting of glass for same, painting, staining, installing electric wiring and fixtures. He is particularly valuable to this institution on account of his all-round knowledge of building construction, which makes it possible to conduct almost all the work in the building without the necessity for hiring expert workmen in different lines.

A. H. Koch, Multicolor Operator and Processor's Assistant, \$150 per month:

Mr. Koch does all the printing for this institution which can be handled on our press. He also assists Mr. Fowler with the processing and the installation of exhibits. Mr. Koch casts some of the wax fruits and vegetables which are used in our permanent exhibits and does all the coloring of same. This color work is a decided art, which Mr. Koch does particularly well.

Mary B. Trelease, Stenographer, \$150 per month:

In addition to the ordinary duties of the only stenographer and clerk in an office, Miss Trelease has entire charge of the routine business of the office. She also has direct charge of the janitor and working force of the building, which gives her the responsibility for the cleaning and routine running of the building.

J. A. Benston, Handyman, \$135 per month:

Mr. Benston's duties as handyman include all plumbing, electrical and other miscellaneous repairs in the building, the care of the heating system and filter, the repainting of woodwork and kalsomining of walls. He drives the Ford, doing such errands as the institution requires. He also operates the motion picture machine and on Saturday afternoon and Sunday, every other week, acts as floorman.

Minta Esterly, Information Clerk, \$115 per month:

Miss Esterly has entire charge of the Information Bureau. It is her duty to see that the stock of literature is kept up, to study same so as to be able to intelligently give out information to the public, and to be continually on the lookout for new literature and information which may be valuable to visitors.

Wm. G. Carbee, Janitor, \$105 per month:

In addition to the regular janitor duties in that portion of the building assigned to him, Mr. Carbee acts as floorman a part of each day. On account of the very large crowds visiting the building, it is necessary that some of our organization devote some time each day to patrolling the floors. Mr. Carbee also serves as information clerk to relieve Miss Esterly every other Saturday afternoon and Sunday.

C. R. Ransom, Janitor, \$105 per month:

Mr. Ransom does all the scrubbing and window cleaning in the building. He also cares for the lavatories, wash basins, cuspidors, etc., and does any other cleaning he may be called upon to do.

Jos. T. Roadhouse, Janitor, \$105 per month:

Mr. Roadhouse performs the regular janitor duties for the portion of the building assigned to him. He also cares for the aviary and acts as floorman part of each day and every other Saturday afternoon and Sunday.

Willard Gregory, Night Janitor, \$52.50 per month:

Dewey A. Niles, Night Janitor, \$52.50 per month:

These janitors do the night work, which consists of sweeping the entire exhibit floor space. This work has to be done after the building is closed to the public.

STATE AGRICULTURAL SOCIETY.

Report of officers and regular employees employed by this department on January 1, 1921.

Name of Officer or Employee and Title	Monthly Salary
Chas. W. Paine, Secretary	\$250 00
Fred W. Links, Accountant	175 00
Eleanore Fentzling, Stenographer	110 00
Stella Boyden, Stenographer	100 00
John Garrett, Trackman	100 00
J. J. Murphy, Watchman	100 00
Chas. Joy, Gardener	75 00
	Daily Wage
Manuel Gracia, Foreman	\$6 00 day
Peter Bloom, Laborer	4 00 day
R. S. Burgett, Laborer	4 00 day
Tbos. Floyd, Laborer	4 00 day
Jos. Giles, Laborer	4 00 day
W. P. Saunders, Laborer	4 00 day
J. H. Sullivan, Laborer	4 00 day

During the fiscal year ending June 30, 1920, this department engaged 292 persons for temporary and emergency employment.

The total amount expended for such services was \$20,306.02.

STATE DEPARTMENT OF AGRICULTURE.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
*G. H. Hecke, Director of Agriculture	\$416 65
Dr. J. P. Iverson, Chief, Division of Animal Industry	333 30
Geo. P. Gray, Chief, Division of Chemistry	333 30
D. B. Mackie, Chief Quarantine Officer	275 00
F. W. Read, Specialist in Standardization	275 00
H. S. Smith, Entomologist in Charge	275 00
L. A. Strong, Chief Deputy Quarantine Officer	250 00
R. H. Taylor, Assistant to Chief, Division of Plant Industry	250 00
H. H. Warner, District Supervising Inspector (Standardization), Los Angeles	250 00
Weishaar, L. J., Supervising Inspector, Standardization	250 00
Dr. J. G. Jackley, Assistant to Chief, Division of Animal Industry	225 00
S. V. Christiernson, Standardization Inspector	225 00
Geo. E. Colby, Assistant to Chief, Division of Chemistry	225 00
C. F. Hoyt, Supervisor of Dairy Inspections	225 00
W. C. Jacobsen, Superintendent of Rodent Control	225 00
H. W. Levers, Chief Accountant	225 00
Jas. B. Newsom, Superintendent and Secretary Cattle Protection	225 00
R. L. Nougaret, Viticulturist in Charge	225 00
Dr. A. C. Rosenberger, Supervising Inspector	225 00
W. V. Shear, Potato Seed Inspector	225 00
T. D. Urbahns, Entomologist	225 00
H. M. Armitage, Assistant Entomologist, Alhambra	200 00
Dr. R. E. Duckworth, Veterinary Inspector	200 00
Dr. J. J. Frey, Veterinary Inspector	200 00
Dr. Geo. Gordon, Veterinary Inspector	200 00
Dr. F. H. Guldager, Veterinary Inspector	200 00
Dr. A. F. Hanna, Veterinary Inspector	200 00
Dr. John S. Hay, Veterinary Inspector	200 00
Dr. E. M. Keef, Veterinary Inspector (District)	200 00
Dr. O. W. Kerr, Veterinary Inspector	200 00

*Statutory salary.

STATE DEPARTMENT OF AGRICULTURE—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
Dr. I. G. LaRue, Veterinary Inspector.....	200 00
E. E. Leighton, Attorney, Cattle Protection, Los Angeles.....	200 00
W. G. Marshall, Assistant Chemist.....	200 00
Dr. Stephen O'Toole, Superintendent of Biologies.....	200 00
Dr. G. A. Pfaffman, Veterinary Inspector.....	200 00
Dr. F. G. Whitehead, Veterinary Inspector.....	200 00
Dr. F. P. Wilcox, Veterinary Inspector.....	200 00
W. S. Wilkinson, Technical Assistant.....	200 00
H. G. Asselstine, Factory Inspector.....	175 00
Dr. J. H. Brown, Veterinary Inspector.....	175 00
George Compere, Deputy Quarantine Officer, San Francisco.....	175 00
Harold Compere, Laboratory Assistant, Alhambra.....	175 00
Dr. Arthur Davies, Veterinary Inspector.....	175 00
M. B. Kennedy, Dairy Chemist.....	175 00
Dr. M. E. McDonald, Veterinary Inspector.....	175 00
Dr. J. E. McMillan, Veterinary Inspector.....	175 00
M. E. O'Dea, Fruit and Vegetable Inspector, San Francisco.....	175 00
B. A. Reynolds, Editor.....	175 00
C. H. Vary, Deputy Quarantine Officer, Los Angeles.....	175 00
Dr. L. A. Brown, Veterinary Inspector.....	175 00
Ralph H. Gray, Inspector of Fruits and Vegetables, Los Angeles.....	166 65
W. I. Newcomb, District Apple Inspector, San Francisco.....	166 65
E. W. Rust, Parasitological Entomologist, South Africa.....	166 65
A. W. Tate, Jr., District Apple Inspector, Watsonville.....	166 65
Glenn Wiley, Fruit and Vegetable Inspector, Los Angeles.....	166 65
H. F. Larsen, Fruit and Vegetable Inspector, Los Angeles.....	166 65
Mrs. K. W. Brown, Secretary-Stenographer.....	150 00
A. C. Chatterley, Quarantine Inspector, San Francisco.....	150 00
Stewart Chatterley, Quarantine Inspector, San Francisco.....	150 00
H. H. Clendennen, Quarantine Inspector, San Francisco.....	150 00
M. E. Coulter, Dairy Inspector.....	150 00
A. C. Fleury, Quarantine Inspector, San Pedro.....	150 00
L. E. French, Quarantine Inspector, San Diego.....	150 00
Winnifred Kady, Principal Clerk.....	150 00
D. W. MacNair, Dairy Inspector.....	150 00
B. D. Mason, Dairy Inspector.....	150 00
J. W. Mashmeyer, Quarantine Inspector, Los Angeles.....	150 00
J. H. Pratt, Sheep Inspector.....	150 00
W. M. Russell, Dairy Inspector.....	150 00
G. R. Wilson, Quarantine Inspector, San Francisco.....	150 00
I. D. Whitaker, Dairy Inspector.....	150 00
A. S. Taylor, Apple Inspector, Los Angeles.....	150 00
Gladys M. Kipp, Bookkeeper.....	140 00
C. E. Mace, District Cattle Inspector—Cattle Protection.....	140 00
Edward Reddy, Cattle Inspector—Cattle Protection.....	140 00
Louis Williams, Cattle Inspector—Cattle Protection.....	140 00
D. B. Conley, Bookkeeper-Clerk.....	135 00
J. M. Olsen, Quarantine Inspector, San Pedro.....	135 00
Harry Stiner, Codling Moth Inspector, Los Angeles.....	135 00
G. S. Wice, Codling Moth Inspector, Los Angeles.....	135 00
Margaret J. Colson, Viticultural Assistant, San Francisco.....	125 00
Caroline M. Delp, Clerk—Quarantine, Los Angeles.....	125 00
Girard E. Green, Laboratory Assistant, Alhambra.....	125 00
Eda L. Johannsen, Stenographer.....	125 00
Jane A. Cain, License Clerk.....	125 00
Carrie G. Macdonald, Clerk—Cattle Protection.....	125 00
Elva McMillan, Stenographer.....	125 00
Edith F. Mensing, Stenographer.....	125 00
Verda Ervin, Stenographer.....	115 00
Claire E. Dutton, Clerk—Quarantine, San Francisco.....	110 00
Minnie Raun, Stenographer.....	110 00
Myrtle R. Smith, Stenographer.....	110 00
Mildred Hickey, Stenographer.....	100 00
Mildred Heisch, Stenographer.....	100 00
Mildred Linden, Stenographer, Los Angeles.....	100 00
Alice O'Brien, Stenographer, Cattle Protection.....	100 00
Sarah C. Tucker, Clerk.....	100 00
Harry Farros, Laboratory Assistant, Chemistry Laboratory.....	90 00
Lillian Johnson, Stenographer, Los Angeles.....	90 00
Virginia Leal, Stenographer, Cattle Protection.....	90 00
Katherine Muller, Stenographer, San Francisco, Quarantine.....	90 00
Bertha Neiger, Stenographer.....	90 00
Gertrude M. Thompson, Stenographer.....	90 00
Frances Thompson, Clerk.....	90 00
Sylvia J. Wall, Stenographer.....	90 00
Irene Hamschildt, Stenographer.....	85 00
Ruth A. Henderson, Typist, Cattle Protection.....	85 00
Pearl Trovathan, Clerk, Cattle Protection.....	85 00
Marie K. Shalag, Typist and Telephone Operator.....	80 00

STATE DEPARTMENT OF AGRICULTURE—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
Adelaide Charonnat, Mailing Clerk.....	75 00
Margaret Craddock, Clerk, Cattle Protection.....	75 00
Frank Dahms, Messenger.....	70 00
Naomi J. Johns, Stenographer, Watsonville.....	70 00
†E. E. Kaufman, Statistician.....	50 00
†A. H. Call, Collaborator.....	25 00
†Frederick Maskew, Collaborator.....	25 00
†O. A. Pratt, Collaborator.....	25 00
†Harold Van Tassel, Collaborator.....	25 00
†Dr. Charles Keane, Chief Inspector, Cattle Protection.....	175 00
†Dr. H. W. C. Lichtenwalter, Veterinary Inspector.....	175 00
†Chas. Cooley, Sheep Inspector.....	150 00
	Daily Wage
†Louis E. Delaney, Apple Inspector.....	7 50
†S. E. Elliott, Apple Inspector.....	7 50
†F. H. Nohrden, Apple Inspector.....	7 50
†Arthur Hsbrn, Inspector, Cattle Protection.....	7 00
†Dr. H. Bergh, Sheep Inspector.....	6 00
†T. M. Pierce, Inspector, Chemistry Division.....	5 00
†A. C. Pickett, Inspector, Chemistry Division.....	5 00
†C. E. Graves, Laborer.....	4 25
†Mrs. Marie E. Clisbam, Stenographer-Clerk.....	4 00
†Edgar Nelson, Laborer, Whittier.....	4 00
†Grace O'Toole, Laboratory Assistant.....	4 00

State Department of Agriculture.

(Report of temporary and emergency help for the fiscal year ending June 30, 1930.)

Number, Title, and Rate	Amount
3 Carpenters at \$7 per day.....	\$262 50
5 Carpenters at \$8 per day.....	226 50
3 Clerks at \$85 per month.....	441 47
1 Janitor at \$3.50 per day.....	27 25
1 Inspector (Cattle Protection) at \$100 per month.....	103 00
1 Inspector (Cattle Protection) at \$125 per month.....	60 48
1 Inspector (Grape) at \$10 per day.....	70 00
1 Laborer at \$0.44 per hour.....	3 96
2 Laborers at \$0.75 per hour.....	18 00
6 Laborers at \$3.50 per day.....	26 25
6 Laborers at \$4 per day.....	223 00
1 Laborer at \$5 per day.....	70 00
1 Laboratory Assistant at \$0.50 per day.....	89 00
1 Mechanic at \$5 per day.....	27 50
4 Stenographers at \$3 per day.....	303 00
4 Stenographers at \$85 per month.....	303 00
1 Stenographer at \$85 per month.....	170 00
	\$2509 71

The carpenters and laborers were employed principally because of change in location of offices.

CALIFORNIA STATE BOARD OF ARCHITECTURE.

1039-1040 Phelan Building, Phone Douglas 3420, San Francisco, California, January 29, 1921.

Northern District—Clarence R. Ward, President; Sylvain Schnaittacher, Secretary and Treasurer;
James R. Miller, John J. Donovan, Edward GlassSouthern District—John Parkinson, President; A. M. Edelman, Secretary and Treasurer;
William J. Dodd, Myron Hunt, William H. Wheeler.

State Board of Architecture—Northern District.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Employee and Title	Monthly Salary
Isabel F. Panella, Assistant Secretary.....	\$75 00

Respectfully submitted: SYLVAIN SCHNAITTACHER, Secretary.

†Intermittent employment.

State Board of Architecture—Southern District.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary or Daily Wage
John Parkinson, President.....	No compensation
A. M. Edelman, Secretary-Treasurer.....	No compensation
Dorothy M. Caton, Assistant Secretary.....	\$85 00 per month

A. M. EDELMAN, Secretary.

OFFICE OF ATTORNEY GENERAL.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
U. S. Webb, Attorney General.....	\$500 00
E. B. Power, Assistant Attorney General.....	333 33½
Robert W. Harrison, Chief Deputy Attorney General.....	333 33½
Robert T. McKisick, Deputy Attorney General.....	275 00
Frank English, Deputy Attorney General.....	275 00
J. Chas. Jones, Deputy Attorney General.....	250 00
John H. Riordan, Deputy Attorney General.....	256 00
Frank L. Guereña, Deputy Attorney General.....	250 00
Leon French, Deputy Attorney General.....	250 00
Arthur Keetch, Deputy Attorney General.....	250 00
W. H. Cobb, Photographic Reporter.....	150 00
H. A. Syme, Clerk.....	150 00
John W. Maltman, Clerk.....	150 00
R. L. Chamberlain, Service Agent.....	150 00
Elise Anderson, Stenographer.....	125 00
Janet Gardner, Stenographer.....	125 00
Helen M. Barber, Stenographer.....	125 00
Grace B. Webb, Stenographer.....	125 00
Marion McLean, Stenographer.....	125 00
Bertha Bruckner, Stenographer.....	100 00
Lewis Crawford, Porter.....	40 00

All salaries fixed by statute.

STATE BANKING DEPARTMENT, SAN FRANCISCO, CALIFORNIA.

Charles F. Stern, Superintendent of Banks

State Banking Department.

Name of Officer or Employee and Title	Monthly Salary
Charles F. Stern, Superintendent of Banks.....	\$833 30
J. M. Oliver, Attorney.....	500 00
T. B. Sullivan, Assistant.....	450 00
C. B. Wingate, Chief Deputy.....	350 00
Y. C. Porch, Examiner.....	325 00
A. B. Jacoby, Examiner.....	3 00 00
Frank J. Mountain, Assistant.....	300 00
F. D. Elliott, Examiner.....	275 00
A. G. Briggs, Assistant.....	250 00
John J. McFaul, Assistant.....	250 00
Merton Belcher, Examiner.....	250 00
H. D. Swengel, Examiner.....	250 00
A. E. Bary, Assistant.....	225 00
J. O. Cunha, Examiner.....	225 00
H. J. Irwin, Examiner.....	225 00
Geo. James, Examiner.....	225 00
C. E. Lowell, Examiner.....	225 00
W. B. Sullivan, Examiner.....	225 00
C. J. Carey, Assistant.....	210 00
D. S. Canny, Assistant.....	210 00
F. J. Sullivan, Examiner.....	200 00
C. M. Cushman, Assistant.....	175 00
L. M. Scollard, Assistant.....	150 00
W. J. Murphy, Assistant.....	140 00
L. M. Jacobson, Dictaphone Operator.....	125 00
Willie Kelly, Dictaphone Operator.....	125 00
L. M. Willson, Dictaphone Operator.....	125 00
Helen L. Roberts, Telephone Operator and Librarian.....	125 00
Gladys Bremer, Assistant.....	120 00
D. B. Courtney, Assistant.....	120 00
E. Wallerstein, Dictaphone Operator.....	110 00
E. W. Davis, Attorney (Assistant one-half time).....	100 00
Elizabeth Boyer, Assistant.....	75 00

Submitted in response to your request of February 3, 1921.

Yours very truly, CHARLES F. STERN, Superintendent of Banks; by A. G. Briggs, Assistant.
To State Civil Service Commission, Sacramento, California, February 9, 1921.

†Intermittent employment.

BUILDING AND LOAN COMMISSIONER.

San Francisco, California, January 31, 1921.

Salaries of Building and Loan Commissioner and Employees.

	Salary Per Month
Geo. S. Walker, Building and Loan Commissioner.....	\$300 00
J. L. Fields, Chief Deputy Building and Loan Commissioner.....	200 00
Moses Stern, Deputy Building and Loan Commissioner.....	150 00
L. P. McKinney, Clerk and Stenographer.....	115 00
	<hr/> \$765 00

All salaries paid from fees collected by Building and Loan Commissioner from building and loan associations. Geo. S. Walker, Commissioner.

CAPITAL PLANNING COMMISSION.

State Civil Service Commission, Forum Building, Sacramento, California.

Gentlemen: In reply to your circular letter of January 28, addressed to the Capital Planning Commission: This commission has no paid officers or employees.

Very truly yours, (Signed) MILTON J. FERGUSON, State Librarian.

SUPERINTENDENT CAPITOL BUILDING AND GROUNDS.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
W. S. Conger, Superintendent.....	\$250 00
W. H. Sutton, Electrician.....	190 00
Wm. Vortriede, Head Gardener.....	175 00
Ed. Van Alstine, Clerk.....	150 00
T. McDermont, Engineer.....	150 00
P. Kerrigan, Policeman.....	120 00
J. C. Beard, Policeman.....	120 00
Fred Wallace, Policeman.....	120 00
R. W. Callnon, Policeman.....	120 00
W. H. Benner, Policeman.....	120 00
S. G. Hess, Policeman.....	120 00
J. C. Knapp, Policeman.....	120 00
H. W. Harner, Typewriter Expert.....	125 00
J. B. McGuire, Policeman (Governor's Mansion).....	110 00
O. W. Erlewine, Policeman (Governor's Mansion).....	110 00
N. L. Theobald, Policeman (Governor's Mansion).....	110 00
R. H. Jeffrey, Policeman (Governor's Mansion).....	110 00
John Marsh, Fireman.....	110 00
Wm. Wicks, Head Porter.....	110 00
John Toft, Assistant Head Gardener.....	110 00
Thos. Cunningham, Florist, 27 days at \$4.....	108 00
S. A. Street, Mechanic, 27 days at \$4.....	108 00
G. F. Zentgraf, Gardener, 25 days at \$4.....	100 00
Wm. Schuler, Gardener, 25 days at \$4.....	100 00
Robt. Brown, Gardener, 25 days at \$4.....	100 00
W. B. Fouts, Gardener, 25 days at \$4.....	100 00
W. J. D. Trusdale, Gardener, 25 days at \$4.....	100 00
Wm. Roland, Gardener, 25 days at \$4.....	100 00
Thos. Eddy, Gardener, 25 days at \$4.....	100 00
H. W. Budd, Gardener, 25 days at \$4.....	100 00
J. Eichel, Gardener, 25 days at \$4.....	100 00
C. Strum, Gardener, 25 days at \$4.....	100 00
A. Ozali, Gardener, 25 days at \$4.....	100 00
L. H. Larkin, Gardener, 25 days at \$4.....	100 00
J. W. Moore, Gardener, 25 days at \$4.....	100 00
T. J. Olds, Gardener, 25 days at \$4.....	100 00
Sam Lunnetta, Porter, 25 days at \$4.....	100 00
Jos. A. Perry, Porter, 25 days at \$4.....	100 00
Dan McGuire, Porter, 25 days at \$4.....	100 00
J. Mills, Porter, 25 days at \$4.....	100 00
G. W. Roberts, Porter, 25 days at \$4.....	100 00
J. A. Read, Porter, 25 days at \$4.....	100 00
J. F. Rohr, Porter, 25 days at \$4.....	100 00
Wm. Peterson, Porter, 25 days at \$4.....	100 00
Frank Tosi, Porter, 25 days at \$4.....	100 00
F. Bailey, Porter, 25 days at \$4.....	100 00
James Gallagher, Porter, 25 days at \$4.....	100 00
Marco Zarick, Porter, 25 days at \$4.....	100 00
J. M. Shannon, Elevator Attendant.....	100 00
C. L. Taylor, Elevator Attendant.....	100 00
Mrs. A. J. Wallquist, Telephone Operator.....	90 00
Mrs. R. C. Oakley, Telephone Operator.....	90 00
Miss Nina Bullard, Telephone Operator.....	90 00
Wm. Brown, Teamster.....	86 00

Respectfully submitted: W. S. CONGER, Superintendent.

STATE BOARD OF CHARITIES AND CORRECTIONS.

Name of Officer or Employee and Title	Monthly Salary
Cornelia McKinne Stanwood, Secretary	\$300 00
Anita Eldridge, Chief Agent	190 00
Esther De Turbeville, Agent	190 00
Margaret F. Sirch, Agent	190 00
Mabel Weed, Agent	175 00
Ora B. Morrison, Stenographer	110 00
Alexina D. Brune, Stenographer	110 00
Emily E. King, Stenographer	120 00
Alix G. Smith, Agent	120 00
Louise M. Ploeger, Chief Clerk	125 00
Eva L. Witter, Field Nurse	125 00
Dorothy Botsford, Agent	125 00

San Francisco, February 3, 1921.

(Statement of the number of persons engaged for temporary or emergency employment during the fiscal year ending June 30, 1920.)

Name	Total Amount Expended
Mabel Mollinder, Stenographer	46 61
E. Hoburg, Stenographer	20 00
Helen Haas, Stenographer	68 00
G. A. Kessler, Stenographer	13 00
Dorothy Barrett, Stenographer	18 00
Marie Muhlman, Stenographer	74 00
Grace Stearns, Special Agent	28 33
Mary L. Gilbert, Statistical Work	25 80
Pauline Ritterman, Stenographer	5 00
Ethel White, Stenographer	80 00
Ethel Fitzpatrick, Stenographer	30 00
Louise Ploeger, Special Agent	126 13
	\$534 87

State Board of Charities and Corrections, February 3, 1921.

STATE CIVIL SERVICE COMMISSION.

David J. Reese, President; Edgar Williams, Charles Wesley Reed.

J. C. Whitman, Chief Examiner; Miss Nova J. Beal, Secretary.

Sacramento, February 11, 1921.

List of employees and salaries as of January 1, 1921.

Name and Title	Monthly Salary
D. J. Reese, *President	\$250 00
C. W. Reed, *Commissioner	250 00
Edgar Williams, *Commissioner	250 00
Nova J. Beal, Secretary	225 00
E. H. Escher, Assistant Examiner	215 00
H. G. Baugh, Assistant Examiner	175 00
Lodema Shurtleff, Chief Clerk	175 00
J. C. Whitman, Chief Examiner	\$137.50. (Half of salary paid by Board of Control.)
Gladys Coffman, Stenographer	100 00
Valverde Milliken, Roster Clerk	100 00
Ruth Oakley, Certification Clerk	100 00
Gwendolyn Phaup, Counter Clerk	100 00
Florence Knuthson, Typist	85 00
Sadie Edgcomb, Stenographer in San Francisco Office	10 00

Number of temporary or emergency employees during fiscal year ending June 30, 1920—6.

Total amount spent for this emergency work—\$309.22.

STATE COMPENSATION INSURANCE FUND.

Salary roll as of January 1, 1921.

NOTE—All salaries and other expenses paid from premiums collected upon compensation insurance policies issued to employers.

Name and Title	Monthly Salary
C. W. Fallows, Manager	\$833 33
Dr. Lester Newman, Medical Director	400 00
E. R. Welch, Secretary	375 00
H. B. Humphry, Los Angeles Branch Manager	375 00
Dr. Orta Edward Kuhn, Assistant Medical Director	300 00
Frank J. Creede, Attorney	300 00
Grove J. Fink, Fiscal Secretary	300 00

*Statutory position.

STATE COMPENSATION INSURANCE FUND—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
R. W. Pendegast, Assistant Secretary	275 00
Walter G. Voogt, Auditor	275 00
E. F. Goelzer, Chief Insurance Inspector	275 00
L. S. Moorhead, Los Angeles Assistant Branch Manager	250 00
E. L. Dougherty, San Francisco Executive Special Agent	250 00
Jos. J. Gallagher, Superintendent Underwriting Department	250 00
J. R. Cornwell, Resident Special Agent	200 00
Geo. J. Bush, Cashier	200 00
Chas. F. Dunsmoor, Resident Special Agent	200 00
William N. Mullen, Superintendent Claim Department	200 00
Bennett E. Pemberton, Assistant Attorney	200 00
Dr. P. W. Seals, Assistant Medical Director	200 00
Hugh T. Higginbotham, Superintendent Payroll Department	200 00
W. S. Tutt, Special Agent and Payroll Auditor	200 00
J. L. Kearney, Claim Representative, Los Angeles	190 00
Beatrice M. Mark, Assistant Superintendent Claim Department	185 00
Arthur E. Brown, Resident Special Agent	180 00
R. B. Gates, Assistant Superintendent Payroll Department	175 00
Roy James Burrowes, Special Agent	175 00
F. Britton McConnell, Assistant Superintendent Underwriting Department	175 00
C. Preston Mead, Payroll Auditor	175 00
Walter James O'Connor, Assistant Attorney	175 00
Thomas F. Driscoll, Inspector	165 00
Belden M. McPike, Claim Examiner	165 00
Horace Hyatt Wadsworth, Special Agent	165 00
Howard W. Brune, Payroll Auditor	160 00
Ralston Whitcomb, Inspector	160 00
Herbert R. White, Claim Auditor	160 00
Paul C. Trout, Payroll Auditor	160 00
Frank R. Kahn, Payroll Auditor and Special Agent	150 00
Rolland J. McDevitt, Special Agent and Payroll Auditor	150 00
Walter Durst, Payroll Auditor and Special Agent	150 00
Joseph P. Ryan, Special Agent	150 00
F. J. Cailteux, Special Agent and Payroll Auditor	150 00
J. H. Friend, Resident Special Agent	150 00
Ben Bloom, Statistician	150 00
Fred Elgin, Compensation Insurance Classification Clerk	145 00
Linda M. Johnson, Chief Clerk, Renewal Division	145 00
Hugh T. Dykes, Counter Claim Clerk	145 00
Mrs. M. Morcom, Bookkeeper	145 00
James E. Nugent, Multicolor press operator	145 00
George S. Beasley, Claim Investigator	135 00
George F. Drury, Hollerith Tabulating Machine Operator	135 00
Esther Anderson, Claim Examiner Division B	135 00
Blanche Kollman, Assistant to Auditor	135 00
Florence M. Robinson, Stenographer, Secretary	135 00
Muriel J. Roberts, Claim Examiner	135 00
Ella Mae Slinkard, Claim Examiner	135 00
Myra G. Daly, Stenographer	130 00
Frances K. Dolan, Stenographer, Secretary	130 00
Ethel Paetzold, Stenographer, Secretary	130 00
James Thomas Daley, Assistant Claim Examiner	125 00
Harold Eugene Gill, Claim Investigator	125 00
Constance C. Dever, Stenographer	125 00
Ada H. Powell, Nurse and Medical Secretary	125 00
Harry Roy Palmer, Underwriter-Clerk	125 00
Mrs. Mary C. McCarthy, Clerk	120 00
Hazel Kress, Assistant to Chief Clerk	120 00
Catherine A. Reiners, Comptometer Operator	120 00
Ida A. Gewertz, Stenographer	120 00
Alfred J. Twyford, Chief Clerk—Coverage Division	120 00
E. Brosnan, Assistant to Cashier	120 00
G. Spowart, Comptometer Operator	120 00
Mrs. Amy Jackson, Chief Clerk (File and Mail.)	120 00
Mrs. Leita A. Davis, Stenographer	115 00
Mrs. Frances L. Young, Compensation Insurance Classification Clerk	115 00
P. H. Shepard, Clerk	115 00
N. Frank A. Schuler, Supply Clerk	115 00
Leona Biber, Stenographer	115 00
Gertrude Mason, Stenographer and Clerk	115 00
Irene E. Pollok, Assistant Multicolor Press Operator	110 00
M. M. Mitchell, Policy writer	110 00
Dorothy Leftwich, Stenographer and Clerk	110 00
Mattie Grace Klindera, Stenographer and Clerk	110 00
M. P. P. Evans, Chief Statistical Code Clerk	110 00
Sylvia Wiesman, Stenographer	110 00
Lucille E. Shoecraft, Assistant Chief Coverage Clerk	110 00
Mrs. G. H. Becker, Stenographer	110 00
Juliana Schneider, Stenographer	110 00
Helen I. Doherty, Register Clerk	110 00
Ruth Doherty, Addressograph Operator	110 00
Mrs. G. M. Cardinal, Stenographer	105 00

STATE COMPENSATION INSURANCE FUND—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
Mrs. E. L. Bulin, Stenographer	105 00
Elizabeth Fotheringham, Stenographer-Clerk	105 00
Ethel Borden, Dictaphonist	105 00
Miriam G. Bock, Stenographer-Clerk	105 00
Mildred Eltringham, Policy writer	105 00
Mabel Nelson, Wahl Adding Machine Operator	105 00
Irene Ney, Policy writer	105 00
Effie Stahmer, Stenographer	105 00
Irene L. Seike, Comptometer Operator	105 00
Helen Schulke, Stenographer	105 00
Mayme E. Guss, Dictaphonist	105 00
Edna F. Danielson, Payroll Classification Clerk	100 00
D. W. Burbank, Counsel, part-time	100 00†
S. M. Bigelow, File Clerk	100 00
Adelaide Feyge, Assistant to Claim Examiner	100 00
Mildred E. Chapman, Assistant to Claim Examiner	100 00
Esther V. Gilbert, Stenographer	100 00
C. C. Hodnett, Comptometer Operator	100 00
Gladys Stegemann, Comptometer Operator	100 00
Mrs. Mary Hardacre, Classification Clerk	100 00
Irene McCloy Williams, Hollerith Key Operator (Punch)	100 00
Mrs. E. M. Wolfe, Stenographer	100 00
Emily S. Terry, Claim Examiner	100 00
Esther Roesch, Comptometer Operator and Telephone Exchange Operator	100 00
Mrs. E. F. Raschen, Payroll Clerk	100 00
Emilia G. Marianetti, Dictaphonist	100 00
Rosela Orchison, Dictaphonist	100 00
Wm. Leslie, Consulting Actuary, part-time	100 00†
Mrs. M. L. Meeker, Clerk	100 00
Donald A. Lavore, Special Agent	100 00
Frances C. Painter, Clerk	95 00
Gerda Karp, Stenographer	95 00
Mercedese Y. Rankin, Coverage Clerk	95 00
Madge E. Rice, Statistical Card Clerk	95 00
Dorothy Rubenstein, Policy writer	95 00
Clotilde L. Chamey, Policy writer	95 00
Rose Gewertz, Dictaphonist	95 00
Margaret Gillies, Key Punch Operator	95 00
Mrs. H. M. Goessi, Burroughs Bookkeeping Machine Operator	95 00
Beatrice H. Guiges, Dictaphonist	95 00
Mrs. E. B. Barber, Multicolor Press Operator	95 00
George Flynn, Assistant Claim Examiner	95 00
G. R. Fredricks, Stenographer	95 00
Mrs. D. L. Tracy, Dictaphonist	95 00
Mable Stone, Stenographer	95 00
Pauline Strause, Policy writer	95 00
Olive R. Hampton, Clerk	95 00
Claire D. Sullivan, Dictaphonist	90 00
Christina R. Nicol, Hollerith Key Punch Operator	90 00
Lila M. Jamison, Stenographer, Clerk	90 00
Maude Ostrom, Key Punch Operator	90 00
Alice L. McCormick, Key Punch Operator	90 00
Ella M. McCullough, Typist	90 00
E. Edith McKay, Policy writer	90 00
Johannah Munroe, Typist-Clerk	90 00
Asher Lavore, Claim Clerk	90 00
Hope J. Lobner, Typist	90 00
Adrice A. Rice, Clerk	90 00
Ethel Ruebin, Clerk	90 00
Eunice E. Buffum, Check-writer typist	90 00
Enrico De Paoli, Clerk	90 00
M. E. Ellis, Policy writer	90 00
Assunta Banchemo, Stenographer	90 00
Charles Cullen, Jr., Claim Clerk	90 00
Adeline Katherine Conn, Stenographer	90 00
Adele Walker, Coverage Clerk	90 00
Adele Tarrant, Clerk	90 00
E. R. Sikola, Typist-checkwriter	90 00
Mrs. R. Statler, Coverage Clerk	90 00
Florence E. Striegel, Typist	90 00
Marguerite H. Haaf, Policy writer	85 00
La Verne Jester, Typist	85 00
Claire K. Sheehan, Clerk	85 00
Vera Thelma Winterberg, Typist-checkwriter	85 00
Mrs. Verbina M. Thomas, Nurse	85 00
Evelyn A. Ward, Stenographer	85 00
Mrs. A. DeMartini, File Clerk	85 00
Claire K. Dougherty, Typist-checkwriter	85 00
Ethel F. Boscoe, Clerk	85 00
Marjory Fritshaw, Clerk	85 00
Annette Fine, Clerk	85 00

†Part-time service.

STATE COMPENSATION INSURANCE FUND—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
Marian Claire, Clerk	85 00
Catherine Labourdette, Dictaphonist	85 00
Ruth Cliver, Typist	85 00
Mrs. F. Peddicord, Typist	85 00
Florence Ryberg, Clerk	85 00
Agnes L. Ritchie, Typist	85 00
Mrs. Blanche C. O'Malley, Chief Index Clerk	85 00
Mrs. N. McMahon, Typist	85 00
Mary I. McFarlane, Clerk	85 00
Mrs. Hilda I. Mayar, Typist-checkwriter	85 00
Mary McRae, Index Clerk	80 00
Beatrice Patane, Typist-Interpreter	80 00
Clarence F. Olsson, Claim Clerk	80 00
C. Hubert Marella, Clerk	80 00
Mrs. L. A. Buehler, Typist	80 00
Mrs. Fern I. Drew, Clerk	80 00
Wm. L. J. Bonilla, Clerk	80 00
Katheryn C. Swinyer, Typist	80 00
Mrs. Violet Beck, Clerk	80 00
Isabell C. Concannon, Clerk	80 00
Lorraine M. Colety, Stenographer	80 00
Estelle D. Goodwin, Clerk	80 00
Martin P. Schmitt, Clerk	80 00
Mary E. Howell, Clerk	80 00
Florence Donaghy, Clerk	75 00
Rometta McDevitt, Stenographer	75 00
Helen McKenna, Typist	75 00
Elsie F. T. Moylan, Clerk	75 00
Bertha Lazor, Clerk	75 00
Rita Lucas, Clerk	75 00
Maude M. Kazaka, Clerk	75 00
Helen Isabel Pierce, Clerk	75 00
Belle F. Power, Index Clerk	75 00
Loretta Runge, Clerk	75 00
Lloyd Palmer, Claim Clerk	75 00
Myrtle Goldie, Typist	75 00
Mrs. E. Griffin, Clerk	75 00
Mrs. E. Feintuch, Clerk	75 00
Cecelia Crowley, Clerk	75 00
Anna Theresa Cuneo, Typist bill clerk	75 00
Louise Bauman, Clerk	75 00
Stanley E. Fogeson, Messenger	75 00
Mrs. Betty Bennett, Clerk	75 00
Mrs. Madaline Fries, Clerk	75 00
Emma L. Emery, File Clerk	75 00
Mrs. E. E. Arrick, Index Clerk	75 00
Rita L. Andre, Clerk	75 00
Sophie Sanko, Typist bill clerk	75 00
Geraldine G. Uphoff, Clerk	75 00
Catherine Verheyen, Typist	75 00
Elsie S. Wenderoth, Typist bill clerk	75 00
Florence Helen Hastler, Clerk	75 00
Loretta Holcomb, Clerk	75 00
Elfrida Schulz, Post Office Clerk	75 00
Cordella Hambidge, Typist	75 00
Frances Dolan, File Clerk	70 00
Hazel E. Ellis, File Clerk	70 00
Bernice C. Borkheim, Typist	70 00
Elmer Clyde Berry, Messenger	70 00
Frances Basse, Clerk	70 00
Emily Barreto, Clerk	70 00
Lois M. Baringer, Clerk	70 00
Pauline Callaway, Clerk	70 00
Corona Ghirardelli, File Clerk	70 00
Esta Smook, Typist-Clrk	70 00
Edith M. Osgoode, File Clerk	70 00
Lilly Signe Ongman, File Clerk	70 00
Mary Urbano, Clerk	70 00
Wm. Mibach, Messenger	65 00
Edward Maloney, Messenger	65 00
Jas. Wm. DeLaney, File Clerk-Messenger	65 00
Sidney C. Hinds, File Clerk	65 00
Merrion Bright, Messenger	65 00
Marian Ellis Hammersmith, Index Clerk	60 00
Richard P. Stevens, Messenger	60 00
Marshal A. Whiting, Messenger	60 00
Lawrence McDermid, Messenger	60 00
Ardith Sweetland, Clerk	60 00

NOTE.—Except for \$40 paid to one person for moving assistance when expanding offices, there have been no persons engaged for strictly temporary or emergency work. In many instances persons have been employed to assist in disposing of accumulated work but such persons have been absorbed in the permanent organization to meet the demands of a rapidly growing business or to fill vacancies caused by separations.

STATE BOARD OF CONTROL.

Payroll as of January 1, 1921, for general office.

Name, Title and Department	Monthly Salary
Marshall DeMotte, Chairman, Board of Control	\$416 65*
Clyde L. Seavey, Member, Board of Control	416 65*
H. S. Benedict, Member, Board of Control	416 65*
S. F. Allen, Secretary, Board of Control	300 00*
F. L. Lathrop, Farm Expert, Board of Control	300 00
H. C. Bottonoff, Assistant Secretary, Board of Control	275 00
L. A. Norton, Chief Clerk, Board of Control	200 00
M. L. Stone, Senior Clerk, Board of Control	175 00
R. E. Jeffrey, Estimate Clerk, Board of Control	165 00
Ray Heider, Claims Clerk, Board of Control	165 00
Lenore Calkins, Property Agent, Property Department	150 00
A. O. Hoover, Bookkeeper, Board of Control	150 00*
W. J. Moody, Clerk, Board of Control	150 00*
J. A. Petit, Clerk, Board of Control	150 00*
J. C. Whitman, Classification Expert, Board of Control	137 50
Maybelle Harris, Bookkeeper, Board of Control	135 00
Marie Hammond, Clerk, Board of Control	125 00
Hazel Baker, Clerk, Board of Control	125 00
Mrs. L. C. Porter, Stenographer, Board of Control	125 00*
Alma Schroth, Stenographer, Board of Control	125 00*
Eva Keuchler, Stenographer, Board of Control	125 00
Vera E. Pollard, Chief Tel. Operator, Los Angeles Office	115 00
Bessie Firlotte, Minute Clerk, Board of Control	100 00
A. Bone, Janitor, Board of Control	100 00
Mrs. E. Huddleston, Telephone Operator, Los Angeles Office	100 00
Mrs. Estelle Erwin, Stenographic Clerk, Board of Control	100 00
Mrs. R. Melaik, Clerk, Property Department	100 00
Lois Twogood, Clerk, Board of Control	85 00
Mary Soule, Clerk, Board of Control	85 00
Lois Healey, Stenographer, Los Angeles Office	85 00
Berniece McCracken, Information Clerk, Board of Control	75 00
John Parenti, Messenger, Board of Control	75 00*
Gaylord Nye, Messenger, Board of Control	10 00†

DEPARTMENT OF PUBLIC ACCOUNTING.

Payroll as of January 1, 1921.

Name, Title and Department	Monthly Salary
Corning de Saules, Sup't of Accounts, Dept. of Public Accounting	\$300 00*
S. Gundelfinger, Classification Expert, Dept. of Public Accounting	250 00
William Schleip, Asst. Sup't of Accounts, Dept. of Public Accounting	225 00*
A. R. Heron, Asst. Sup't of Accounts, Dept. of Public Accounting	225 00*
W. H. Wandesford, Senior Accountant, Dept. of Public Accounting	200 00
H. E. Smith, Senior Accountant, Department of Public Accounting	200 00
P. B. Potter, Senior Accountant, Department of Public Accounting	200 00
Clarence E. Malm, Senior Accountant, Department of Public Accounting	200 00
R. L. Hatch, Senior Accountant, Department of Public Accounting	200 00
J. W. Krieger, Junior Accountant, Department of Public Accounting	175 00
W. C. Meads, Junior Accountant, Department of Public Accounting	175 00
R. R. Soberanes, Junior Accountant, Department of Public Accounting	175 00
Cameron F. Bradley, Junior Accountant, Dept. of Public Accounting	160 00
C. G. Fallon, Junior Accountant, Department of Public Accounting	160 00
R. S. Mudge, Junior Accountant, Department of Public Accounting	160 00
E. V. Curley, Junior Accountant, Department of Public Accounting	150 00
Clair C. Barnes, Junior Accountant, Department of Public Accounting	150 00
Albert Fuller, Junior Accountant, Department of Public Accounting	150 00
Fred B. Sprague, Junior Accountant, Department of Public Accounting	125 00
Amy B. Warner, Stenographer, Department of Public Accounting	125 00

*Statutory.

†Part-time service.

ORPHAN AID DEPARTMENT.

Payroll as of January 1, 1921.

Name, Title and Department	Monthly Salary
Amy D. Steinhart, Chief Children's Agent, Orphan Aid Department.....	\$225 00*
Geneva S. Orcutt, Children's Agent, Orphan Aid Department.....	175 00*
Reba Ash Ingols, Children's Agent, Orphan Aid Department.....	175 00*
Mrs. Elizabeth Eshleman, Children's Agent, Orphan Aid Department.....	175 00*
Miley M. Pope, Children's Agent, Orphan Aid Department.....	175 00*
Freida Grunewald, Clerk-Stenographer, Orphan Aid Department.....	150 00
Sadie McGorvin, Clerk, Orphan Aid Department.....	125 00
Mrs. Stella Scofield, Assistant Children's Agent, Orphan Aid Department.....	125 00
Mrs. M. Wortz, Stenographer, Orphan Aid Department.....	125 00
Sadie Edgecomb, Stenographer, S. F. Office, Orphan Aid Department.....	100 00
Jeanette Fleisher, Clerk, Orphan Aid Department.....	90 00
Charles Fuller, Messenger, Orphan Aid Department.....	10 00†

STATE CONTROLLER.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
John S. Chambers, State Controller.....	\$416 65*
Jas. L. Atteridge, Inheritance Tax Attorney.....	300 00*
H. C. Lucas (San Francisco), Assistant Inheritance Tax Attorney.....	300 00*
J. W. Carrigan (Los Angeles), Assistant Inheritance Tax Attorney.....	300 00*
C. E. Cooper, Deputy Controller.....	250 00*
W. E. Marten (Sacramento), Assistant Inheritance Tax Attorney.....	225 00*
A. W. Brouillet (San Francisco), Assistant Inheritance Tax Attorney.....	220 00*
E. H. Pennock (Los Angeles), Assistant Inheritance Tax Attorney.....	200 00*
W. H. H. Gentry (San Francisco), Assistant Inheritance Tax Attorney.....	200 00
Dion R. Holm (San Francisco), Assistant Inheritance Tax Attorney.....	200 00
F. R. Swain, Bookkeeper.....	200 00*
M. E. Colgan, Redemption Tax Expert.....	200 00*
T. M. Gannon, Franchise Tax Expert.....	200 00*
L. A. McKee, Superintendent, Franchise Tax Department.....	200 00*
J. W. Hickey, Statistician.....	200 00*
C. H. Smith, Warrant Registrar.....	200 00*
J. D. Tilden, Abstract Bookkeeper.....	185 00
A. C. Stanton, Sacramento, Assistant Inheritance Tax Attorney.....	175 00
Karl R. Levy, Los Angeles, Assistant Inheritance Tax Attorney.....	175 00
Louis B. Diavila, Sacramento, Assistant Inheritance Tax Attorney.....	150 00
Ruby Sawyer, Warrant Clerk.....	150 00*
E. Foster, Assistant Bookkeeper.....	150 00*
Dorothy Chambers, Stenographer-Clerk.....	150 00
Gladys E. Morgan, Clerk-stenographer.....	150 00
George Green, Franchise Tax Clerk.....	150 00
Frank Brooks, Franchise Tax Clerk.....	150 00
Sadie Ames, Warrant Clerk.....	133 30*
J. A. Cunningham, Redemption Tax Clerk.....	133 30*
Lucile Dobson, Redemption Tax Clerk.....	133 30*
D. T. Jenkins, General Clerk.....	133 30*
Felice Connolly, Steno-Clerk.....	125 00*
Mildred Foss, Sacramento, Steno.-Clerk, Inheritance Tax.....	125 00
Alice P. Emigh, Sacramento, Clerk-steno., Inheritance Tax.....	125 00
L. N. Shaw, Sacramento, Bookkeeper, Inheritance Tax.....	125 00
A. E. Wilson, Los Angeles, Clerk-steno., Inheritance Tax.....	125 00
Muriel E. Jones, San Francisco, Clerk-steno., Inheritance Tax.....	125 00*
Alice E. Archer, Los Angeles, Clerk-Steno., Inheritance Tax.....	125 00
Anna B. McAllister, Stenographer.....	115 00
Mabel E. Galvin, San Francisco, Stenographer Inheritance Tax Department.....	110 00
Mildred Griffith, Sacramento, File Clerk Inheritance Tax Department.....	100 00
Agnes M. O'Brien, San Francisco, File Clerk Inheritance Tax Department.....	100 00
Estelle Orsatti, Los Angeles, Stenographer.....	100 00
Jacob Soares, Porter.....	60 00
F. Boniface, Sacramento, Janitor Inheritance Tax Department.....	20 00†

Two clerks were employed by this department for a short period during the year July 1, 1919 to June 30, 1920, the expenditure being \$68.50.

Compiled by L. N. Shaw.

*Statutory.

†Part-time service.

STATE CORPORATION DEPARTMENT.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
E. C. Bellows*, Commissioner	\$416 67
A. G. Fickeisen, Chief Deputy	350 00
S. G. Miles, Auditor	325 00
F. M. Miller, Engineer	325 00
A. Michel, Deputy	300 00
R. L. North, Deputy	300 00
J. C. Murray, Deputy	300 00
John I. Davis, Secretary	275 00
D. P. Goodwin, Deputy	275 00
Alfred Grundy, Deputy	275 00
E. C. Easton, Deputy	275 00
D. W. Minier, Assistant Engineer	275 00
W. E. Telfer, Assistant Auditor	250 00
Katherine Dolan, Stenographer	150 00
Laura Craft, Bookkeeper	125 00
Cleta Shore, Stenographer	125 00
Muriel Emerson, Stenographer	125 00
Edna Huston, Stenographer	125 00
Jean Johnson, Stenographer	125 00
Henrietta Burt, Stenographer	125 00
Mellie Ford, Clerk	115 00
Velma Resser, Stenographer	115 00
Maud Jeffery, Stenographer	115 00
Ella Loughridge, Stenographer	115 00
Edith Graves, Stenographer	115 00
Marion Barry, Stenographer	115 00
Mary Cavalier, Stenographer	115 00
Verne Hopper, Stenographer	115 00
Ivy Madeiros, Stenographer	115 00
Lillian Roth, Stenographer	115 00
John Bailey†, Deputy	100 00
Abbie Williams, Stenographer	100 00
Verna Flinchbaugh, Stenographer	100 00
Pauline Kinsel, Stenographer	100 00
Ethel Hickey, Clerk-Messenger	95 00
Edith Coons, Clerk	85 00
Gertrude Cook, Clerk	85 00
Elizabeth Findlay, Clerk	85 00
Millie Krysto, Clerk	85 00
Helene Lee, Clerk	85 00
Hazel Showler, Clerk	85 00
Evelyn Sissell, Clerk	75 00
Antone Heinrich, Messenger	60 00

During the fiscal year ending June 30, 1920, there were engaged for temporary or emergency employment in the department 19 persons. The total compensation paid to these 19 persons was \$2,705.48.

State Corporation Department: By John L. Davis, Secretary.

*Statutory.

†Part-time service.

STATE OF CALIFORNIA: DISTRICT COURT OF APPEAL, FIRST APPELLATE DISTRICT, CLERK'S OFFICE, Wells Fargo Building.

San Francisco, February 8, 1921.

J. B. Martin, Clerk; Walter S. Chisholm, Deputy.

State Civil Service Commission, Sacramento, California.

GENTLEMEN: Your letter of January 28, addressed to Presiding Justice William H. Waste, and enclosing form to be filled out, data being required for use of the Assembly and Senate, and respecting all officers and employees in each and every department of the State, has been turned over to me for reply. I give you below the desired information:

(Report of officers and regular employees employed by this department on January 1, 1921.)

District Court of Appeal, First District, Divisions One and Two.

Name of Officer or Employee and Title	Monthly Salary
William H. Waste, Presiding Justice, Division One-----	\$583 05
Frank H. Kerrigan, Associate Justice, Division One-----	583 05
John E. Richards, Associate Justice, Division One-----	583 05
William H. Langdon, Presiding Justice, Division Two-----	583 05
John T. Nourse, Associate Justice, Division Two-----	583 05
Geo. A. Sturtevant, Associate Justice, Division Two-----	583 05
*J. B. Martin, Clerk, both Divisions-----	225 00
*C. W. Tucker, Photographic Reporter, Division One-----	200 00
*Mary A. Blass, Photographic Reporter, Division Two-----	200 00
*Walter S. Chisholm, Deputy Clerk, both Divisions-----	166 66
*Willard W. Shea, Deputy Clerk, both Divisions-----	166 66
*D. C. McGanney, Bailiff, Division One-----	133 33
*P. B. Gibson, Bailiff, Division Two-----	133 33
John F. Tyler, Secretary to Justices, Division One-----	125 00
Geraldine McCown, Secretary to Justices, Division One-----	125 00
Christena A. Turner, Secretary to Justices, Division Two-----	125 00
Josephine McAvoy, Secretary to Justices, Division Two-----	125 00
*John F. Finn, Janitor, Division One-----	90 00
Thos. F. Dunn, Librarian, both Divisions-----	75 00
John F. Finn, Janitor, Division Two-----	35 00

Yours truly, J. B. Martin, Clerk.

DISTRICT COURT OF APPEAL, FIRST APPELLATE DISTRICT, DIVISION TWO.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
John B. Martin, Clerk, includes service for Divisions One and Two-----	\$225 00*
Mary A. Blass, Photographic Reporter-----	200 00*
Walter S. Chisholm, Deputy Clerk, includes service for Divisions One and Two-----	166 66*
Willard W. Shea, Deputy Clerk, includes service for Divisions One and Two-----	166 66*
Paul E. Gibson, Bailiff-----	133 33*
Christena A. Turner, Secretary-----	125 00
Josephine McAvoy, Secretary-----	125 00

*Statutory.

OFFICERS AND EMPLOYEES OF THE DISTRICT COURT OF APPEAL, SECOND APPELLATE DISTRICT, DIVISIONS ONE AND TWO.

(Report of officers and regular employees employed by this department on January 1, 1921.)

		January 1, 1921.
Name and Title		Monthly Salary
Nathaniel P. Conrey, Presiding Justice, Division One	-----	\$583 33*
Victor E. Shaw, Associate Justice, Division One	-----	583 33*
W. P. James, Associate Justice, Division One	-----	583 33*
Frank G. Finlayson, Presiding Justice, Division Two	-----	583 33*
Lewis R. Works, Associate Justice, Division Two	-----	583 33*
Gavin W. Craig, Associate Justice, Division Two	-----	583 33*
W. D. Shearer, Clerk	-----	225 00*
J. H. Crumrine, Phonographic Reporter, Division One	-----	200 00*
Eugene B. Stanley, Phonographic Reporter, Division Two	-----	200 00*
H. C. Lillie, Deputy Clerk, Division One	-----	166 66*
H. C. Lillie, Deputy Clerk, Division Two	-----	(No salary)*
Robert S. Clark, Bailiff, Division One	-----	133 33*
A. B. Moreno, Bailiff, Division Two	-----	133 33*
F. H. Johnson, Porter	-----	145 00†

(This includes his services as Porter for the Supreme Court at Los Angeles, and work as Janitor and Porter for the three courts.)

THIRD DISTRICT COURT OF APPEAL.

Clerk's Office, District Court of Appeal, Third Appellate District, State of California.

Sacramento, California, January 31, 1921.

State Civil Service Commission, Forum Building, Sacramento, California.

Pursuant to your request of January 28, 1921, relative to salaries of officers and employees of the Third District Court of Appeal, the following is hereby submitted:

Name and Title	Salary Per Year
Norton P. Chipman, Presiding Justice	\$7,000 00
Albert G. Burnett, Associate Justice	7,000 00
Elijah C. Hart, Associate Justice	7,000 00
John T. Stafford, Clerk	2,700 00
Charles H. Adams, Phonographic Reporter	2,400 00
Cavins Hart, Deputy Clerk	2,000 00
George B. Donaldson, Bailiff	1,600 00
Eva Payne, Secretary	1,500 00
George Didion, Secretary	1,500 00
John Conway, Janitor	1,080 00

Respectfully yours, (Signed) John T. Stafford, Clerk Third District Court of Appeal.

CALIFORNIA STATE BUREAU OF CRIMINAL IDENTIFICATION AND INVESTIGATION.

(Report of Officers and Regular Employees Employed by This Department on January 1, 1921.)

Name of Employee and Title	Monthly Salary
Morrill, C. S., Superintendent	\$200 00
Sked, Wm., Identification Expert	175 00
Schrader, Hart, Jr., Handwriting Expert	175 00
Blair, Muriel, Finger Print Clerk	125 00
Catron, Viola, Finger Print Clerk	125 00
Bollhalter, Frieda, Typist	100 00
Differding, Mildred, Typist	100 00
Morrison, Anna, Typist	100 00
Boniface, Frank, Janitor	25 00

TEMPORARY APPOINTMENTS.

Finch, Madeline (No. C. S. R.), Typist	100 00
Blair, Mrs. W. E. (No. C. S. R.), Typist	100 00

Total amount expended for temporary appointees during the fiscal year ending June 30, 1920, \$2,040.00.

*Statutory.

†Part-time service.

CALIFORNIA SCHOOL FOR THE DEAF AND THE BLIND.

(Report of Officers and Regular Employees Employed by This Department on January 1, 1921.)

Name and Title	Monthly Salary	Maintenance	Total
W. A. Caldwell, Principal	\$250 00	\$165 00	\$415 00
J. S. McCullough, Secretary and Treasurer	250 00		250 00
B. F. Walderon, Laundryman (hires own help)	205 00	35 00	240 00
F. O'Donnell, Principal Assistant	225 00		225 00
H. C. Harter, Teacher Blind	225 00		225 00
J. G. Geddes, Teacher Deaf	175 00		175 00
J. W. Howson, Teacher Deaf	175 00		175 00
W. S. Runde, Teacher Deaf	165 00		165 00
O. Arntzen, Chef	130 00	35 00	165 00
N. Perry, Teacher Blind	162 00		#162 00
J. O. Jensen, Teacher Manual Training	160 00		160 00
J. Treveethan, Engineer	160 00		160 00
E. Pye, Teacher Blind	116 63	35 00	151 63
X. Imholz, Dairyman	110 00	35 00	145 00
T. d'Estrella, Teacher Blind	103 33	35 00	138 33
V. Barnes, Head Matron	100 00	35 00	135 00
M. Biron, Baker	100 00	35 00	135 00
S. Blaker, Teacher Deaf	135 00		135 00
A. Biron, Dairyman	100 00	35 00	135 00
C. B. Cooper, Teacher Deaf	135 00		135 00
M. Eastman, Teacher Blind	135 00		135 00
J. B. Goodrich, Foreman of Grounds	100 00	35 00	135 00
M. Hallett, Teacher Deaf	135 00		135 00
B. H. Hunt, Teacher Deaf	135 00		135 00
B. D. Johnson, Carpenter and Painter	100 00	35 00	135 00
L. Nourse, Teacher Deaf	135 00		135 00
N. Roth, Teacher Deaf	135 00		135 00
V. Smith, Chief Clerk	100 00	35 00	135 00
M. Vinson, Teacher Deaf	135 00		135 00
C. Land, Supervisor and Gymnasium Teacher	95 00	35 00	130 00
M. Miller, Teacher Blind	130 00		130 00
H. Thine, First Assistant Cook	95 00	35 00	130 00
N. Bailhache, Engineer	95 00	35 00	130 00
J. W. Smith, Fireman and Repairman	95 00	35 00	130 00
O. Fleissner, Teacher Music	125 00		#125 00
H. Ingle, Teacher Deaf	125 00		125 00
L. Johnson, Teacher Blind	90 00	35 00	125 00
H. Carmichael, Bookkeeper	90 00	35 00	125 00
W. R. L. Jenks, Teacher Painting	120 00		120 00
R. Ghorzo, Gardener	85 00	35 00	120 00
J. Jones, Gardener	82 50	35 00	117 50
D. Long, Teacher Deaf	80 00	35 00	115 00
G. Mast, Teacher Music	115 00		115 00
R. Burnley, Nurse	75 00	35 00	110 00
S. Carpenter, Teacher Blind Industries	110 00		#110 00
M. Dickhaut, Teacher Domestic Science	105 00		#105 00
M. V. Jenks, Teacher Blind	105 00		105 00
W. McMeen, Teacher Blind	105 00		105 00
G. Forsberg, Clerk	70 00	35 00	105 00
F. Wickman, Clerk	70 00	35 00	105 00
L. Briggs, Teacher Deaf	100 00		100 00
M. L. Emerson, Physician	100 00		#100 00
V. Hare, Matron	65 00	35 00	100 00
M. Hilton, Matron	65 00	35 00	100 00
S. Kirk, Matron	65 00	35 00	100 00
M. Tipton, Matron	65 00	35 00	100 00
W. Bailhache, Housekeeper Hospital	60 00	35 00	95 00
J. Peterson, Potwasher	60 00	35 00	95 00
C. Danforth, Servant	61 00	35 00	95 00
L. Dortch, Waitress	60 00	35 00	95 00
Geo. Peterson, Relief Man	60 00	35 00	95 00
J. Longanbaker, Waiter	60 00	35 00	95 00
J. Carroll, Waiter	61 00	35 00	95 00
C. Hebel, Janitor	60 00	35 00	95 00
W. Miller, Janitor	60 00	35 00	95 00
A. Donahue, Yardman	60 00	35 00	95 00
E. McClintock, Yardman	61 00	35 00	95 00
C. S. Daniels, Storekeeper	60 00	35 00	95 00
A. Bendzumas, Stableman	61 00	35 00	95 00
H. Hecht, Stenographer	95 00		95 00
E. Coplin, Teacher Gymnastics (1 meal)	85 00	19 00	#104 00
L. Nani, Waiter	55 00	35 00	90 00
E. Hytti, Dishwasher	55 00	35 00	90 00
E. Vandegrift, Matron	55 00	35 00	90 00
E. Gay, Teacher Piano Tuning	90 00		#90 00
E. Servatius, Gardener	55 00	35 00	90 00
J. Augustin, Janitor	50 00	35 00	85 00
O. Bigby, Janitor	50 00	35 00	85 00
M. Dillon, Janitress	50 00	35 00	85 00
J. Farrell, Janitor	50 00	35 00	85 00

#Part-time employment.

CALIFORNIA SCHOOL FOR THE DEAF AND THE BLIND—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary	Maintenance	Total
M. Golden, Janitress.....	50 00	35 00	85 00
J. Dondero, Boys' Supervisor.....	50 00	35 00	85 00
F. Stobbe, Teacher Broommaking.....	50 00	35 00	\$85 00
A. Bauslaugh, Boys' Supervisor.....	45 00	35 00	80 00
L. Derr, Girls' Supervisor.....	45 00	35 00	80 00
T. Elliott, Watchman.....	80 00	-----	80 00
R. Mephann, Teacher Shoemaking.....	75 00	-----	\$75 00
E. McGlynn, Teacher Deaf.....	70 00	-----	70 00
M. Perry, Librarian.....	60 00	-----	\$60 00
A. Avenzino, Yardman.....	60 00	-----	60 00
F. Hansen, Repairman.....	60 00	120 00	80 00
M. A. Dutch, Teacher Reading.....	52 50	-----	\$52 50
W. Ludlow, Dentist.....	50 00	-----	\$50 00
S. Wythe, Oculist and Aurist.....	50 00	-----	\$50 00
N. Bigelow, Teacher Orchestra.....	45 00	-----	\$45 00
M. Von Sturner, Teacher Vocal.....	45 00	-----	\$45 00
R. Rice, Teacher Barbering.....	30 00	-----	\$30 00
Emergency Employees—7 extra nurses employed during epidemics and on special cases			\$430 33

BOARD OF DENTAL EXAMINERS OF CALIFORNIA.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
E. L. Dornberger, President.....	-----
A. E. Hackett, Vice President.....	-----
C. A. Herrick, Secretary.....	\$300 00

(Report of temporary or emergency employment during the fiscal year ending June 30, 1920.)

NOTE.—Attorneys are employed by the case with permission obtained from the Attorney General's office in each and every case.

Name of Employee and Position	Compensation
Oliver Dibble, Attorney.....	\$291 50
H. I. Cruzan, Attorney.....	40 00
E. C. Gridley, Attorney.....	60 00

NOTE.—C. W. Clarke was employed as detective by the month for a period of five months at a salary of \$125. Previous to that she was employed by the case.

C. W. Clarke, Detective.....	821 62
A. Boylariades, Detective.....	226 57
A. R. Smith, Inspector.....	100 95
Helen M. Johnson, Detective.....	72 63
C. W. Clarke, Detective.....	40 20
Sadie Joubert, Detective.....	12 00
Total.....	\$1665 47

STATE DENTAL SURGEON.

Name of Officer and Title	Monthly Salary
Dr. Leo J. McMahon, State Dental Surgeon.....	\$300 00

STATE DEPARTMENT OF EDUCATION.

Name of Officer or Employee and Title	Salary
Will C. Wood, Superintendent of Public Instruction.....	\$5000* yr.
Job Wood, Jr., Deputy Superintendent of Public Instruction.....	250* mo.
Sam H. Cohn, Statistician.....	200*
W. S. Dyes, Bookkeeper, Textbook Department.....	175*
Edna M. Stangland, Secretary, Superintendent Public Instruction.....	150*
Marjorie LaGrave, Clerk, Textbook Department.....	120
Helena Clark, Assistant Statistician.....	115
Onal Stangland, Stenographer.....	100
Georgiana Carden, Attendance Officer.....	75†

*Statutory.

†Part-time service.

#Part-time employment. †Also cottage.

State Board of Education.

Mrs. Margaret S. McNaught, Commissioner of Elementary Schools.....	\$40.00*	yr.
Albery C. Olney, Commissioner of Secondary Schools.....	4000*	
Edwin R. Snyder, Commissioner of Vocational and Industrial Education.....	4000*	
J. C. Beswick, Supervisor of Trade and Industrial Subjects.....	300	mo.
J. B. Lillard, Supervisor of Agricultural Instruction.....	300	
Maudie I. Murchie, Supervisor of Teacher Training Courses in Home Economics.....	300	
Clark W. Hetherington, Supervisor of Physical Education.....	3600*	yr.
George Hjelt, Assistant Supervisor of Physical Education.....	230	mo.
Herbert R. Stolz, Assistant Supervisor of Physical Education.....	230	
Winifred Van Hagen, Assistant Supervisor of Physical Education.....	230	
Helen Dimmick, Assistant Secretary in Charge of Credentials.....	200	
Mrs. Florence B. Argall, Assistant Secretary, State Board.....	185	
Marion H. Ketcham, Assistant Secretary, Teachers' Retirement Board.....	170	
Henry M. Lynn, Bookkeeper.....	170	
Mrs. Marie Miller Like, Credential Clerk.....	150	
Edith F. Moore, Secretary-Stenographer.....	125	
Abbie T. Pixley, Secretary-Stenographer.....	125	
May Carpenter, Secretary-Stenographer.....	120	
S. Verna Lynn, Secretary-Stenographer.....	120	
Mrs. Edna Lyon, Secretary-Stenographer.....	115	
M. Bernice Edwards, Credential Clerk.....	115	
Ethel Macpherson, Credential Clerk.....	115	
Jennie Renwick, Credential Clerk.....	115	
Julia Baker, Clerk, Teachers' Retirement Board.....	115	
Ralph Morrill, Mailing and Shipping Clerk.....	115	
Elizabeth Edwards, Stenographer.....	100	
Elizabeth K. Haller, Stenographer.....	95	
Fairah Harber, Stenographer.....	95	
Anice Black, Typist.....	90	
Emma Drungold, Stenographer.....	90	
Bess Watson, File Clerk.....	90	
Velda Aston, Stenographer.....	85	
Funice Tuttle, Messenger.....	70	

Thirty-eight persons engaged for temporary or emergency employment during the fiscal year ending June 30, 1920, and the total amount expended for such temporary or emergency employment was \$1929.59.

STATE BOARD OF EMBALMERS OF CALIFORNIA.

Al. P. Booth, San Francisco; Bessie J. Wood, Oakland; I. J. Reynolds, Pasadena; Claude Woolman, San Diego; George W. Lunt, San Francisco. Bessie J. Wood, Secretary, 1955 Telegraph Avenue, Oakland, California.

State Civil Service Commission, Sacramento, California.

Information regarding State Board of Embalmers.

(1) Department, State Board of Embalmers.

(2) Secretary, Bessie Wood Gustason.

(3) Salary, \$75 per month.

Salary fixed by statute. No other employees.

(Signed) BESSIE WOOD GUSTASON.

*Statutory.

†Part-time service.

DEPARTMENT OF ENGINEERING, STATE OF CALIFORNIA.

Sacramento, California.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Range—\$401 to \$450.		Monthly Salary
Name of Officer or Employee and Title		
W. F. McClure, State Engineer.....		\$416 66*
Range—\$351 to \$400.		
S. T. Harding, Consulting Irrigation Engineer (average).....		360 00†
Geo. B. McDougall, State Architect.....		400 00*
Range—\$301 to \$350.		
C. F. Dean, Chief Designer.....		325 00
J. W. Dutton, Superintendent of Construction.....		325 00
C. H. Kromer, Chief Structural Engineer.....		325 00
Geo. J. Adams, Deputy State Architect.....		335 00
P. M. Norboe, Chief Assistant State Engineer.....		340 00
Range—\$276 to \$300—None.		
Range—\$251 to \$275.		
C. K. Aldrich, Chief Estimator.....		275 00
R. E. Backus, Architectural Designer.....		275 00
G. M. Simonson, Chief Electrical Engineer.....		275 00
H. V. Grant, Superintendent of Construction.....		275 00
Range—\$226 to \$250.		
W. W. Wooldridge, Superintendent.....		235 00
W. J. Long, Structural Draftsman.....		240 00
J. B. Brown, Assistant State Engineer.....		250 00*
H. E. Mackie, General Superintendent.....		250 00*
L. F. Sherwood, Architectural Draftsman.....		250 00
Harry Barnes, Hydrographer.....		250 00
A. H. Memmler, Assistant State Architect.....		250 00*
O. L. Morton, Superintendent of Construction.....		250 00
Range—\$201 to \$225.		
W. H. Epperson, Mechanical Draftsman.....		210 00
G. E. Garthorne, Electrical Draftsman.....		215 00
F. J. Robinson, Foreman Plumber.....		215 00
G. N. Sargent, General Electrical Foreman.....		220 00
G. A. Stewart, Superintendent of Construction.....		225 00
L. E. Rushton, Mechanical Engineer.....		225 00*
Ward Dran, Architectural Designer.....		225 00*
W. K. Potts, Civil Engineer.....		225 00
H. L. McCready, Hydrographer.....		225 00
H. A. Armstrong, Hydrographer.....		225 00
J. E. Tempest, Office Engineer.....		225 00
G. H. Russell, Hydrographer.....		250 00
Chester Marlave, Hydrographer.....		250 00
G. N. Bergren, Superintendent of Construction.....		225 00
B. C. Tarver, Superintendent of Construction.....		225 00
F. A. Brady, Superintendent of Construction.....		225 00
C. M. Weber, Superintendent of Construction.....		225 00
Range—\$176 to \$200.		
W. A. Gilbert, Carpenter Foreman.....		185 00
H. W. DeHaven, Architectural Draftsman.....		185 00
F. B. Hilby, Engineering Draftsman.....		190 00
Glen Rood, Engineering Draftsman.....		190 00
W. H. Phillips, Engineering Draftsman.....		190 00
R. A. Zehnder, Structural Engineer.....		200 00*
J. H. Clarke, Auditor.....		200 00*
A. J. Beakey, Engineer Assistant.....		200 00
J. G. Heath, Estimator.....		200 00
A. H. Potbury, Assistant Mechanical Engineer.....		200 00
C. Pierson, Architectural Draftsman.....		200 00
C. A. Henderlong, Mechanical Draftsman.....		200 00
R. Earl Storie, Hydrographer.....		200 00
M. H. Blots, Hydrographer.....		200 00

* Statutory.

† Part-time service.

DEPARTMENT OF ENGINEERING, STATE OF CALIFORNIA—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Range—\$151 to \$175.

Name of Officer or Employee and Title	Monthly Salary
V. Sanguinetti, Launch Driver.....	160 00
F. F. Huber, Launch Driver.....	160 00
J. Nevins, Timekeeper.....	160 00
R. P. Adams, Engineering Draftsman.....	166 66*
Paul Duncckhorst, Electrical Engineer.....	175 00*
C. H. Bulkeley, Estimator.....	175 00*
H. V. Adams, Architectural Draftsman.....	175 00*
H. J. Devine, Architectural Draftsman.....	175 00*
Chas. Johnston, Bookkeeper.....	175 00
J. C. McCalmont, Bookkeeper.....	175 00
Thos. McCully, Bookkeeper.....	175 00
H. M. Kilburn, Hydrographer.....	175 00
F. M. Stewart, Specification Writer.....	175 00*

Range—\$126 to \$150.

L. A. Bishop, Stenographer.....	135 00
Jas. DeGrosse, Cook.....	135 00
D. H. McMillan, Mechanical Draftsman.....	145 00
S. R. Davies, Architectural Draftsman.....	150 00*
Dorothy Lennox, Clerk.....	170 00*
E. F. McCaffery, Engineering Assistant.....	150 00

Range—\$101 to \$125.

J. V. Rosecrans, Stenographer.....	125 00*
Elsie Koch, Stenographer.....	125 00*
F. J. Butler, Blue Print Pressman.....	125 00*
A. R. Fink, Clerk.....	125 00
M. R. Nickerson, Clerk.....	125 00
F. J. Schlink, Clerk.....	125 00
C. W. Nauman, Engineering Assistant.....	125 00

Range—\$76 to \$100.

Esther Hornbostel, Stenographer.....	96 00
Zae Adams, Stenographer.....	100 00
A. H. Henderson, Filing Clerk.....	100 00

Range—\$50 to \$75.

W. H. Hann, Foreman.....	50 00†
Robt. Moore, Messenger.....	65 00
W. H. Cainell, Janitor.....	75 00*
M. L. Cheshire, Telephone Operator.....	75 00
Edgar A. Brown, Engineer.....	75 00

Range—\$7.00 to \$11.00.

Name of Officer or Employee and Title	Daily Wage
F. M. Rillon, Foreman Plumber.....	\$11 00
R. A. Butler, Construction Foreman.....	10 63
C. F. Martinez, Construction Foreman.....	10 00
T. J. Thompson, Steam Fitter.....	10 00
O. W. Gumm'll, Foreman Electrician.....	9 50
V. Hiner, Carpenter Foreman.....	9 50
F. C. LaVine, Carpenter Foreman.....	9 00
G. H. Knettlar, Carpenter Foreman.....	9 00
H. G. Beers, Carpenter Foreman.....	8 50
S. G. Stewart, Carpenter.....	7 50
J. V. Tarver, Carpenter.....	7 00

Department of Engineering—Statement Showing the Number of Persons Engaged for Temporary or Emergency Employment During the Fiscal Year Ending June 30, 1920, and the Total Amount Expended for Such Temporary or Emergency Employments.

Number of persons.....	803
Total amount expended.....	\$171,716 00

*Statutory.

†Part-time service.

STATE BOARD OF EQUALIZATION.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
*R. E. Collins, Member State Board of Equalization.....	\$333 33½
*John C. Corbett, Member State Board of Equalization.....	333 33½
*John Mitchell, Member State Board of Equalization.....	333 33½
*H. G. Cattell, Member State Board of Equalization.....	333 33½
*M. D. Lack, Secretary State Board of Equalization.....	333 33½
A. L. Wyllie, Chief Clerk Board of Equalization.....	200 00
Irene Cook, Stenographer Board of Equalization.....	133 35

(Temporary from January 1 to July 1, each year.)

†W. H. Everhardt, Senior Clerk, Board of Equalization.....	150 00
†Eva Nichols, Senior Clerk, Board of Equalization.....	133 35
†Mae Seamas, Senior Clerk, Board of Equalization.....	133 35
(Temporary from March 1 to July 1, each year.)	
†T. M. Gannon, Bank Clerk, Board of Equalization.....	230 00

FISH AND GAME COMMISSION.

(Report of officers and regular employees employed by this department on January 1, 1921.)

San Francisco District and Administration.

Name and Title	Monthly Salary
Chas. A. Vogelsang, Executive Officer.....	\$333 33
J. N. Hunter, Assistant Executive Officer.....	250 00
H. C. Bryant, Game Expert in Charge of Publicity and Research Work.....	250 00
R. D. Duke, Attorney.....	250 00
D. O'Connell, Cashier.....	200 00
H. R. Dunbar, License Clerk.....	160 00
E. C. Boucher.....	150 00
Dorothy M. Gray, Secretary-Stenographer.....	135 00
Anna L. Hernon, Finance Clerk.....	135 00
Phyllis R. Jordan, Bookkeeper.....	135 00
Charlotte S. Walker, Steno-Clerk.....	115 00
Carmen Elsasser, Stenographer.....	115 00
Mildred Kellogg, Office Assistant to Dr. Bryant.....	100 00
M. S. Clark, Deputy.....	165 00
W. H. Armstrong, Deputy.....	135 00
Earl P. Barnes, Deputy.....	135 00
Theo. M. Benson, Deputy.....	135 00
O. P. Brownlow, Deputy.....	135 00
F. A. Bullard, Deputy.....	135 00
J. L. Bundock, Deputy.....	135 00
John Burke, Deputy.....	135 00
S. L. N. Ellis, Deputy.....	135 00
J. H. Hill, Deputy.....	135 00
Henry Lencioni, Deputy.....	135 00
E. V. Moody, Deputy.....	135 00
W. J. Moore, Deputy.....	135 00
J. E. Newsome, Deputy.....	135 00
Chas. R. Perkins, Deputy.....	135 00
W. B. Sellmer, Deputy.....	135 00
L. B. Sherwood, Deputy.....	135 00
F. W. Smalley, Deputy.....	135 00
J. H. Hollard, Deputy.....	120 00
Harry N. Brittan, Deputy.....	125 00
J. H. Groves, Deputy.....	125 00
McPherson Lough, Deputy.....	121 60
Tipton Mathews, Deputy.....	125 00
H. S. Prescott, Deputy.....	125 00
Geo. R. Smalley, Deputy.....	125 60
F. W. Faller, Deputy.....	115 00
Herbert Leahy, Deputy.....	115 00
J. D. Dondero, Deputy.....	115 00
B. H. Miller, Deputy.....	115 00
C. I. Sherwood, Deputy.....	110 00
L. W. Longeway, Deputy.....	110 00
Victor E. Von Arx, Deputy.....	100 00
Jay C. Bruce, Lion Hunter.....	100 00
†L. L. Koppel, Deputy.....	80 00

*Statutory.

†Part-time.

FISH AND GAME COMMISSION—Continued.

Sacramento Division.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
†Geo. Neale, Assistant in Charge	150 00
Bessie J. Wilson, Clerk	135 00
E. L. W. Siebert, Clerk	125 00
Leslie Rust, Office Assistant	85 00
T. W. Birmingham, Deputy	135 00
Edw. Bolt, Deputy	135 00
S. J. Carpenter, Deputy	135 00
Geo. W. Courtright, Deputy	135 00
G. I. Fleckenstein, Deputy	135 00
Euell Gray, Deputy	135 00
W. J. Green, Deputy	135 00
G. O. Laws, Deputy	135 00
Wm. Lippincott, Deputy	135 00
Roy E. Ludlum, Deputy	135 00
John O'Connell, Deputy	125 00
R. C. O'Connor, Deputy	135 00
D. E. Roberts, Deputy	135 00
Jos. H. Sanders, Deputy	135 00
R. L. Sinkey, Deputy	135 00
J. S. White, Deputy	135 00
W. J. Lee, Deputy	125 00
John O. Miller, Deputy	125 00
Chas. E. Newsome, Deputy	125 00
E. D. Ricketts, Deputy	125 00
A. J. Stanley, Deputy	125 00
C. O. Fisher, Deputy	115 00
Jas. T. Poe, Deputy	115 00
A. H. Willard, Deputy	115 00
Geo. W. Chamberlin, Deputy	110 00

Los Angeles Division.

E. L. Hedderly, Assistant in Charge	200 00
Dorothy Nash, Steno-Bookkeeper	125 00
H. I. Pritchard, Deputy	165 00
E. H. Ober, Deputy	150 00
J. H. Gyger, Deputy	135 00
W. L. Hare, Deputy	135 00
C. F. Maddox, Deputy	135 00
Webb Toms, Deputy	135 00
H. J. Abels, Deputy	125 00
H. D. Becker, Deputy	125 00
C. O. Brenner, Deputy	125 00
J. H. Harrington, Deputy	125 00
G. A. McAfee, Deputy	125 00
†J. J. Barnett, Deputy	85 00
†W. C. Malone, Deputy	85 00
†C. B. Tibbetts, Deputy	70 00

Commercial Fisheries Department.

N. B. Scofield, In Charge of Department	360 00
W. F. Thompson, Fishery Expert	275 00
L. F. Lingle, Fishery Expert	225 00
C. S. Baudet, Assistant	200 00
H. B. Nidever, Fishery Expert	200 00
Harry R. Beard, Chemist	200 00
Elmer Higgins, Assistant Fishery Expert	200 00
Earle Downing, Assistant	195 00
S. H. Dado, Assistant	185 00
W. L. Scofield, Assistant Fishery Expert	175 00
P. H. Oyer, Assistant in Charge Monterey Office	175 00
A. L. Manahan, Assistant in Charge San Diego Office	170 00
Arthur W. Wells, Technical Assistant	166 66
A. M. Fairfield, Pollution Expert	160 00
Herbert E. Foster, Captain "Quinnat"	160 00
E. M. Nielsen, Assistant	150 00
Harlan B. Holmes, Assistant Fishery Expert	150 00
Albert Mack, Assistant	140 00
Geraldine Conner, Clerk	135 00
Chas. M. Boutin, Assistant on "Quinnat"	135 00
Roy Steele, Captain Launch "Steelhead"	135 00
Clarence Mulder, Engineer Launch "Albacore"	135 00
Clarence Groat, Assistant	125 00

†Part-time service.

FISH AND GAME COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Commercial Fisheries Department—Continued.

Name and Title	Monthly Salary
Halsey E. Fink, Assistant.....	125 00
†J. O. Snyder, Fishery Expert.....	125 00
Gladys Bulger, Statistical Assistant.....	115 00
Helen M. Edwards, Assistant.....	110 00
Stephen Spaan, Deckhand-Cook "Albacore".....	85 00
Bert L. DePry, Assistant.....	85 00
Mrs. B. H. Marshall, Statistical Assistant.....	85 00
†O. E. Sette, Assistant Fishery Expert.....	50 00
†F. W. Weymouth, Assistant Fishery Expert.....	50 00
†Mary McConnell, Assistant.....	10 00

Department of Fish Culture.

Wm. H. Shebley, In Charge of Department.....	300 00
Engene W. Hunt, Field Superintendent.....	250 00
Giles H. Lambson, Superintendent Mt. Shasta Hatchery.....	195 00
John H. Hoerl, Assistant.....	190 00
Harriett P. Leitch, Stenographer.....	110 00
Zella M. Rose, Clerk.....	90 00
W. O. Fassett, Hatchery Superintendent.....	190 00
Geo. McCloud, Jr., Hatchery Superintendent.....	180 00
Albert E. Doney, Ladder Inspector.....	170 00
E. V. Cassell, Hatchery Foreman.....	165 00
Jas. W. Ricker, Hatchery Foreman.....	165 00
Geo. E. West, Hatchery Foreman.....	165 00
Alex. E. Culver, Screen Inspector.....	150 00
Clarence Nixon, Hatchery Foreman.....	150 00
Lachean McLean, Skilled Laborer.....	140 00
Manfred K. Spaulding, Skilled Laborer.....	135 00
J. Cecil Brandenburg, Hatchery Foreman.....	135 00
Geo. McCloud, Sr., Superintendent of Fish Distribution Car.....	130 00
Louis Phillips, Superintendent of Fish Distribution Car.....	130 00
Jas. L. Stinnett, Hatchery Foreman.....	125 00
Justin Shebley, Hatchery Foreman.....	125 00
Chas. L. Frame, Hatchery Foreman.....	125 00
Guy C. Tabler, Hatchery Foreman.....	125 00
McClellan Woods, Hatchery Assistant.....	115 00
John Singlaub, Sr., Hatchery Assistant.....	115 00
J. O. Jacobson, Hatchery Assistant.....	115 00
Wm. H. Pepper, Hatchery Assistant.....	115 00
Jas. Landy, Hatchery Assistant.....	115 00
Ed. Clessens, Hatchery Assistant.....	115 00
Alex. Chappieu, Hatchery Assistant.....	110 00
Romauldo Galetti, Hatchery Assistant.....	110 00
Jos. C. Lewis, Hatchery Assistant.....	110 00
Edward Lewis, Hatchery Assistant.....	110 00
Fred W. Sifers, Hatchery Assistant.....	110 00
Byron Sherry, Hatchery Assistant.....	110 00
Ross A. McCloud, Hatchery Assistant.....	105 00
Silas T. Jordan, Hatchery Assistant.....	100 00
Ross W. Davis, Hatchery Assistant.....	100 00
Claude C. Dollarhide, Hatchery Assistant.....	100 00
John Franklin, Hatchery Assistant.....	100 00
Albert Lane, Hatchery Assistant.....	100 00
Coleman A. Sealf, Hatchery Assistant.....	100 00
Jesse L. Stout, Hatchery Assistant.....	100 00
John B. Sollner, Hatchery Assistant.....	90 00

Daily Wage

C. L. Cadle, Watchman.....	\$5 00
O. W. Dickey, Watchman.....	5 00
Geo. Olsen, Watchman.....	5 00
Robert H. Watson, Watchman.....	5 00
John A. Zion, Watchman.....	5 00
Robert Rupp, Watchman.....	2 00
Robert Boyd, Hatchery Assistant.....	3 50
Richard A. Pape, Hatchery Assistant.....	3 00
Ricardo Mattei, Spawntaker.....	1 00

During the fiscal year ending June 30, 1920, there were 62 persons engaged for temporary or emergency work. Amount expended for such work, \$2,618.50.

†Part-time service.

CALIFORNIA STATE BOARD OF FORESTRY.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
*G. M. Homans, State Forester.....	\$250 00
*M. B. Pratt, Deputy State Forester.....	200 00
A. E. Frost, Inspector.....	150 00
Anna D. Duffy, Secretary.....	150 00
Gertrude Tonzi, Stenographer.....	125 00
Helen M. Bontz, Typist.....	100 00
†C. Stowell Smith, Trustee, California Forestry Committee.....	100 00

In March, 1920, a committee called The California Forestry Committee was formed to investigate the question of slash disposal and certain other items of common interest in need of solution. This committee was composed of a representative from each of the five following organizations: The State Board of Forestry, the United States Forest Service, University of California, the Southern Pacific Company (non-operating timber lands) and the California White & Sugar Pine Manufacturers' Association. It was agreed that each organization would contribute \$100.00 per month toward the expenses of these investigations, using Mr. Smith, Secretary of the Pine Association (who serves as Trustee for the committee) as a clearing house.

The following employees were allowed maintenance only for the fiscal year ending June 30, 1920, their salaries having been paid by the Federal Government under a cooperative agreement whereby the Federal Government was to pay the salaries and the State Board of Forestry the expenses away from headquarters of these District Fire Rangers:

†A. W. Ford.
 †A. E. Frost.
 †H. H. Huntsberger.
 †Wm. Jenkins.

We have totaled the traveling expenses for the fiscal year ending June 30, 1920, of these four men and translated it into a cash equivalent, per schedule attached to letter from Civil Service Commission dated January 28, 1921.

Traveling expenses four district fire rangers.....	\$444 85
One meal per day for one month at 75 cents per day.....	22 50
Maximum for three meals.....	67 50
Single quarters (at \$1.45† per day).....	43 70
Maximum allowance for maintenance per man.....	111 20

Temporary or emergency employees July 1, 1919, to June 30, 1920: 373 firefighters; total expenditure, \$3347.23.

CALIFORNIA SCHOOL FOR GIRLS.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary	Maintenance	Total
Mary A. Hill, Superintendent.....	\$300 00	\$35 00	\$335 00
M. di Giannini, Physician.....	200 00	35 00	235 00
Anne H. Upton, Assistant Superintendent.....	160 00	35 00	195 00
Edith Harkins, Chief Clerk.....	125 00	35 00	160 00
Oline Singleton, Head Farmer.....	125 00	35 00	160 00
Alice T. Weed, Parole Officer.....	125 00	-----	125 00
B. Frank Hill, Engineer.....	125 00	35 00	160 00
Mattie L. Oldham, School Principal.....	100 00	35 00	135 00
Winifred Owens, Teacher of Discipline.....	100 00	35 00	135 00
Edna Anderson, Domestic Science Teacher.....	100 00	35 00	135 00
Olive L. Ruhland, Physical Director.....	100 00	35 00	135 00
Ada E. Vesper, Sewing Instructor.....	100 00	35 00	135 00
Mary E. Moore, Parole Officer.....	100 00	-----	100 00
Charles Pratt, Assistant Engineer.....	95 00	35 00	130 00
Frank A. Bentz, Carpenter.....	95 00	14 75	109 75
Elsie L. Weeks, Surgical Nurse.....	95 00	35 00	130 00
Julia Hook, Laundry Instructor.....	90 00	35 00	125 00
Edward Ramsey, Chauffeur-Fireman.....	90 00	35 00	125 00
Mabel Cave, Statistical Clerk.....	85 00	35 00	120 00
Stella McCuskey, Bookkeeper.....	85 00	35 00	120 00
Winifred Hill, Nurse.....	85 00	35 00	120 00
Mabel Ramsey, High School Teacher.....	80 00	35 00	115 00
Louise Hamilton, Commercial Teacher.....	80 00	35 00	115 00
Vera A. Miller, School Teacher, Grade.....	80 00	35 00	115 00
Euclid Dempsey, School Teacher, Grade.....	80 00	35 00	115 00
Harriet Bloodgood, School Teacher, Grade.....	80 00	35 00	115 00
Alcinda Roberts, Weaving Teacher.....	80 00	35 00	115 00

*Statutory positions.

†Part time service.

CALIFORNIA SCHOOLS FOR GIRLS—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary	Maintenance	Total
Louise Medlen, Sewing Instructor.....	80 00	35 00	115 00
Tida Mercer, Housemother.....	80 00	35 00	115 00
Margaret Smiley, Housemother.....	80 00	35 00	115 00
Grace Mettler, Housemother.....	80 00	35 00	115 00
Elizabeth Shanley, Housemother.....	80 00	35 00	115 00
Harriet Ritter, Housemother.....	80 00	35 00	115 00
Cora A. Jones, Housemother.....	80 00	35 00	115 00
Elizabeth Edmundson, Assistant Lost Private Officer.....	80 00	35 00	115 00
Elmira N. Merriam, Kitchen Officer.....	80 00	35 00	115 00
Anna L. Morrison, Kitchen Officer.....	80 00	35 00	115 00
Gisela Brownrigg, Kitchen Officer.....	80 00	35 00	115 00
Alice Morlan, Kitchen Officer.....	80 00	35 00	115 00
Jennie E. Straley, Kitchen Officer.....	80 00	35 00	115 00
Allie B. Weimar, Kitchen Officer.....	80 00	35 00	115 00
Fred Bush, Night Watchman.....	80 00	35 00	115 00
Dorothy Lord, Head Garden Officer.....	80 00	35 00	115 00
George H. Meyers, Farm Hand.....	75 00	35 00	110 00
Steve Burnett, Farm Hand.....	75 00	35 00	110 00
Daniel E. Smith, Farm Hand.....	75 00	35 00	110 00
Susan B. Less, Commissary Clerk.....	70 00	35 00	110 00
Laura B. Bentz, Yard Officer.....	70 00	14 75	84 75
Carrie B. Allen, Stenographer.....	70 00	35 00	105 00
Pearl Ellis, Stenographer.....	70 00	35 00	105 00
Catherine Matthews, Dormitory Watch.....	65 00	35 00	100 00
Beth Thompson, Dormitory Watch.....	65 00	35 00	100 00
May C. Bane, Dormitory Watch.....	65 00	35 00	100 00
Jean M. Hamilton, Dormitory Watch.....	65 00	35 00	100 00
Annie E. Clements, Yard Officer.....	65 00	35 00	100 00
M. Eleanor Perry, Relief Officer.....	65 00	35 00	100 00
Emily L. Atling, Relief Officer.....	65 00	35 00	100 00
Martha A. Powell, Relief Officer.....	65 00	35 00	100 00
Ethel Tyler, Relief Officer.....	65 00	35 00	100 00
Addie Wood, Relief Officer.....	65 00	35 00	100 00
Charlotte Saxemeyer, Relief Officer.....	65 00	35 00	100 00
Lillian Gibson, Assistant Sewing Department.....	25 00	35 00	60 00
Clarice Wells, Office Assistant.....	15 00	35 00	50 00

Persons Engaged for Temporary or Emergency Employment During Fiscal Year Ending June, 1920.

Person Engaged and For What	Amount Expended
Dr. D. R. Smith, Dentistry, July, 1919.....	\$49 00
Dr. R. W. Homer, Surgery, July, 1919.....	9 00
Hirschfelder Shoe Co., Repair of Shoes, July, 1919.....	36 95
Oxnard Welding Co., Welding Menlo Heater, Aug., 1919.....	14 00
Bartlett Company, Tuning and Repairing Pianos, Aug., 1919.....	23 00
Dr. E. K. Roberts, Dental Work, Sept., 1919.....	29 50
Dr. Geo. A. Morrison, Optical Work, Sept., 1919.....	42 00
Dr. Geo. A. Morrison, Optical Work, Sept., 1919.....	16 00
Dr. Lewis, Surgery, Sept., 1919.....	10 50
Dr. C. A. Jensen, Surgery, Sept., 1919.....	5 00
Hirschfelder Shoe Co., Repairing Shoes, Sept., 1919.....	18 35
Dr. R. W. Homer, Surgery (Incurred in June, 1919), Sept., 1919.....	9 00
John Behn, Recharging Batteries, June, 1919.....	8 00
Dr. E. K. Roberts, Dentistry, Oct., 1919.....	75 00
Dr. Geo. H. Morrison, Optical Work, Oct., 1919.....	68 00
Dr. C. A. Jensen, Surgery, Oct., 1919.....	75 00
Hirschfelder Shoe Co., Repairing Shoes, Oct., 1919.....	29 85
H. P. Seppendorf, Installing Burner, Oct., 1919.....	31 50
J. H. Johnson, Blacksmithing, Nov., 1919.....	4 40
Geo. A. Morrison, Ocultist, Nov., 1919.....	38 00
J. A. Johnson, Shoeing Horses, Dec., 1919.....	8 25
O. M. Geibil, Recharging Batteries, Dec., 1919.....	1 75
Dr. Geo. A. Morrison, Ocultist, Dec., 1919.....	94 75
Dr. Geo. W. Brown, Surgery, Dec., 1919.....	15 00
Hirschfelder Shoe Co., Repairing Shoes, Dec., 1919.....	12 90
Oxnard Welding Co., Welding and Testing Menlo Heaters, Jan., 1920.....	28 35
F. H. Roby, Care of Cemetery Lot One Year, Jan., 1920.....	10 00
J. J. Street, Vet. Sug., Veterinary Visits, Jan., 1920.....	10 00
M. T. Boles, Hauling Coal, Jan., 1920.....	64 00
F. M. Barrows, Hauling Coal, Jan., 1920.....	59 82
W. T. Kenney, Installing and Adjusting Motion Picture Machine, Jan., 1920.....	7 50
W. L. Magby, Repair Auto, Jan., 1920.....	2 00
W. L. Magby, Repair Work, Jan., 1920.....	8 10
Dr. Geo. A. Morrison, Ocultist, Jan., 1920.....	30 00
Hirschfelder, Repairing Shoes, Jan., 1920.....	13 45
Richardson Bros., Overhauling Battery, Repair Tires, Jan., 1920.....	25 75

CALIFORNIA SCHOOLS FOR GIRLS—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Persons Engaged for Temporary or Emergency Employment During Fiscal Year
Ending June, 1920—Continued.

Persons Engaged and For What	Amount Expended
M. T. Boles, Hauling Coal, Jan., 1920.....	64 00
Barrows & Sons, Hauling Coal, Jan., 1920.....	69 97
W. L. Magby, Work on Dodge Car, Jan., 1920.....	54 34
O. N. Geibel, Recharging Battery, Jan., 1920.....	2 50
Norman Blacksmithing Co., Shoeing Horses, Jan., 1920.....	2 50
Trustees Whittier School, Research Work, Jan., 1920.....	50 00
O. H. Hedges, Repairing Leather Belt, Feb., 1920.....	35
J. F. Plunkett, Blanking Typewriters, March, 1920.....	3 00
Dr. Geo. A. Morrison, Oculist, March, 1920.....	50 00
Trustees Whittier State School, Pro Rata Research Work, Feb., 1920.....	50 00
Trustees Whittier State School, Pro Rata Research Work, March, 1920.....	50 00
Burroughs Adding Machine Co., Inspecting Adding Machine, March, 1920.....	5 20
Dr. H. W. Alden, Dentistry, March, 1920.....	50 48
Dr. Geo. A. Morrison, Oculist, March, 1920.....	51 00
Hirschfelder Shoe Co., Repairing Shoes, April, 1920.....	31 35
Trustees Whittier State School, Pro Rata Research Work, April, 1920.....	50 00
Dr. H. W. Alden, Dentistry, April, 1920.....	21 00
Mrs. B. W. Truslow, Music Teacher, April, 1920.....	25 00
W. L. Magby, Welding Boilers, May, 1920.....	33 61
J. A. Johnson, Shoeing Horses, May, 1920.....	8 50
J. A. Johnson, Shoeing Horses, May, 1920.....	8 75
Oxnard Welding Co., Welding Heater, May, 1920.....	25 00
O. M. Geibel, Recharging, Insulating, May, 1920.....	20 40
Dr. C. A. Jensen, X-ray, May, 1920.....	8 00
Hirschfelder Shoe Co., Repairing Shoes, May, 1920.....	18 80
Trustees Whittier State School, Pro Rata Research Work, May, 1920.....	50 00
Dr. Geo. H. Morrison, Oculist, May, 1920.....	40 00
Dr. H. W. Alden, Dentistry, June, 1920.....	21 00
Oxnard Welding Co., Welding Heater, June, 1920.....	10 00
Singer Sewing Machine Co., Adjusting Sewing Machines, June, 1920.....	7 00
Eugene Rogers, Hanging Window Shades, June, 1920.....	23 00
O. N. Geibel, Recharging Batteries, June, 1920.....	1 50
J. A. Johnson, Shoeing Horses, June, 1920.....	3 00
Dr. J. J. Streets, Veterinary Visits, June, 1920.....	26 00
Hirschfelder Shoe Co., Repairing Shoes, June, 1920.....	23 85
Trustees Whittier State School, Pro Rata Research Work, June, 1920.....	50 00
Dr. Geo. H. Morrison, Oculist, June, 1920.....	20 00
Mrs. W. B. Truslow, Music Teacher, June, 1920.....	50 00

GOVERNOR'S OFFICE.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
W. D. Stephens, Governor.....	\$861-\$900. \$833 30*
Martin C. Madsen, Private Secretary.....	\$401-\$450. 416 65*
Henry A. Frazier, Executive Secretary.....	\$276-\$300. 300 00*
Mrs. V. Albright, Stenographer.....	\$151-\$175. 166 65*
Myrtle Murray, Stenographer.....	\$101-\$125. 125 00
W. P. Murray, Messenger.....	125 00*

LIEUTENANT GOVERNOR.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
C. C. Young, Lieutenant Governor.....	\$801-\$850. \$333 30*

*Statutory.

BOARD OF STATE HARBOR COMMISSIONERS.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
J. H. McCallum, President	\$416 66
F. G. White, Chief Engineer	416 66
F. E. Stewart, Superintendent Belt Railroad	375 00
H. E. Squires, Assistant Harbor Engineer	325 00
W. A. Sweat, Traffic Manager	300 00
Chas. H. Witham, Superintendent Const. and Repairs	300 00
Thos. Flaherty, Acting Chief Wharfinger	300 00
W. E. Shafer, Master Mechanic	260 00
H. H. Cosgriff, Commissioner	250 00
F. S. Moody, Commissioner	250 00
Hilda Gohrman, Secretary	250 00
L. M. King, Office Engineer	250 00
A. A. M. Russell, Testing Engineer	250 00
C. N. Young, Chief Draftsman	250 00
J. C. Symons, General Foreman—T. & D.	250 00
C. P. Stanton, Foreman Electrician	250 00
J. Byrne, Jr., Assistant Secretary	240 00
Frank Miller, Tug Captain	240 00
Chas. S. Love, Tug Captain	240 00
A. W. Nordwell, Draftsman	230 00
J. B. Graham, Foreman Painter	280 00
O. W. Jones, Draftsman	225 00
G. A. Wood, Draftsman	225 00
J. G. Webb, Inspector	225 00
J. T. McQuoid, Inspector	225 00
T. S. Garrett, Inspector	225 00
D. R. Dewar, Foreman Blacksmith	220 00
Andrew Mackie, Draftsman	215 00
H. P. Wickersham, Draftsman	215 00
A. D. Janssen, Draftsman	215 00
S. E. Evans, Draftsman	215 00
H. E. Johnstone, Marine Engineer	215 00
J. T. Duff, Marine Engineer	215 00
L. K. Palmtag, Chief Transitman	210 00
B. A. Buler, Head Leverman	205 00
F. G. Graham, Head Leverman	205 00
H. J. Frederick, Chief Accountant	200 00
Daniel A. Ryan, Attorney	200 00
John M. LaRue, G. and M. Clerk	200 00
L. G. Fisher, Draftsman	200 00
W. G. Winter, Draftsman	200 00
Frank Nash, Inspector	200 00
H. E. Newsome, Inspector	200 00
J. F. Edelman, Inspector	200 00
W. F. Brandon, Stationary Engineer	200 00
T. E. Wadsworth, Stationary Engineer	200 00
George Anderson, Stationary Engineer	200 00
C. J. Mitchell, Chief Clerk, B. R. R.	200 00
J. H. Nelson, Foreman of Pavers	190 00
W. A. Pennell, Foreman of Patchers	190 00
R. W. Cudworth, Foreman of Laborers	190 00
F. L. Tuttle, Chief Clerk Wharfinger	185 00
J. E. Hopkins, Foreman of Janitors	185 00
M. O'Donnell, Roadmaster	185 00
G. N. Dyson, Transitman	180 00
E. Roberts, Leverman	180 00
J. H. Smith, Leverman	180 00
F. E. Whorfi, Maintenance Electrician	175 00
Lawrence O'Rourke, Maintenance Electrician	175 00
H. A. Thompson, Maintenance Electrician	175 00
E. T. Joste, Dockage Clerk	175 00
Chas. Morrison, Toll Clerk	175 00
W. A. Conneau, Clerk	175 00
J. A. Pell, Head Timekeeper	175 00
J. E. Fitzgerald, Clerk	175 00
R. G. Frank, Cost Accountant	175 00
Andrew Skero, Foreman of Sweepers	172 50
A. E. Beckett, Wharfinger	170 00
H. M. Brown, Wharfinger	170 00
E. M. Buckley, Wharfinger	170 00
E. J. Callan, Wharfinger	170 00
L. J. Caldwell, Wharfinger	170 00
J. N. Colter, Wharfinger	170 00
A. W. Davidson, Wharfinger	170 00
Jos. DeMartini, Wharfinger	170 00
W. F. Dunleavy, Wharfinger	170 00
W. F. Eshbacher, Wharfinger	170 00
David Fox, Wharfinger	On Sick Leave

BOARD OF STATE HARBOR COMMISSIONERS—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
George Franke, Wharfinger	170 00
John Gillson, Wharfinger	170 00
J. T. Hanley, Wharfinger	170 00
C. F. Kenneally, Wharfinger	170 00
W. C. Mackintosh, Wharfinger	170 00
Chas. Mautalen, Wharfinger	170 00
F. A. Neary, Wharfinger	170 00
George Roth, Wharfinger	170 00
J. A. Sullivan, Wharfinger	170 00
John Wessling, Wharfinger	170 00
Gilbert H. Littlejohn, Port Statistician	165 00
E. L. Harms, Budget Clerk	165 00
W. J. McWhinney, Clerk	160 00
W. M. Diebles, Clerk	160 00
J. B. Silva, Clerk	160 00
J. T. Fitzsimmons, Clerk	160 00
G. S. Bockrath, Clerk	160 00
R. J. Elliott, Material Clerk	160 00
E. J. Flaherty, Chauffeur and Automobile Mechanic	160 00
Jesse Mayer, Engineer's Assistant	150 00
J. B. Kidd, Engineer's Assistant	150 00
Joseph Tehaney, Engineer's Assistant	150 00
C. E. Clark, Launch Captain	150 00
Mabel G. Jackson, Private Secretary	140 00
J. P. Lynch, Policeman	140 00
J. D. Nolan, Policeman	140 00
D. F. McCarthy, Policeman	140 00
F. Gleason, Policeman	140 00
J. McNamara, Night Foreman Janitor	138 50
Clyde Lane, Claims Clerk and Comptometer Operator	135 00
Lester Stern, Clerk	135 00
Dennis Mahony, Fireman Tugs	135 00
Jas. McQuaid, Fireman Tugs	135 00
Joseph E. Flynn, Deckhand	135 00
Harry Arata, Deckhand	135 00
J. Hutchings, Deckhand	135 00
G. Stock, Deckhand	135 00
J. B. Kenney, Deckhand	135 00
L. Cox, Deckhand	135 00
R. Demartini, Deckhand	135 00
J. F. Haggerty, Deckhand	135 00
M. Kane, Deckhand	135 00
A. Fallman, Deckhand	135 00
C. Crilley, Deckhand	135 00
Geo. Buchl, Deckhand	135 00
Frank Ryan, Deckhand	135 00
Thos. P. Loughran, Deckhand	135 00
T. B. Parker, Fireman Dredgers	135 00
J. F. Bealer, Fireman Dredgers	135 00
George Pratt, Fireman Dredgers	135 00
James Cotter, Fireman Dredgers	135 00
F. L. Halby, Storekeeper	125 00
Philip Diez, Electrician's Helper	125 00
Jas. Radford, Fire Marshal	125 00
Nina Clark, Telephone Operator	125 00
Hattie L. Kennard, Bookkeeping Machine Operator	125 00
Mary E. Hughes, Expert File Clerk	125 00
Berthold Moose, Watchman	120 00
Hector Brodie, Boatman	120 00
G. H. Tait, Watchman	120 00
G. G. Coleman, Watchman	120 00
J. J. Williams, Watchman	120 00
August Hardors, Watchman	120 00
Dan Desmond, Watchman	120 00
H. A. Harris, Watchman	120 00
L. A. Valentin, Watchman	120 00
H. Hader, Watchman	120 00
Marie Lind, Stenographer	110 00
Frances L. Wentworth, Stenographer	110 00
Mrs. L. Brennan, Matron	110 00
M. J. Mullally, Matron	90 00
Celia Hart, Matron	90 00

On Sick Leave

BOARD OF STATE HARBOR COMMISSIONERS—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
H. B. Fuse, Diver.....	\$9.00 per day and \$10.00 per diver†
G. F. Berry, Piledriver Foreman.....	\$10 00
T. J. Denahy, Piledriver Foreman.....	10 00
Archie McBride, Piledriver Foreman.....	10 00
C. A. Elanore, Foreman Electrician.....	9 50
W. L. Rhys, Electrician.....	9 00
S. W. Tyler, Electrician.....	9 00
John Lembke, Electrician.....	9 00
R. J. Dever, Electrician.....	9 00
J. H. Kennard, Electrician.....	9 00
H. J. Doherty, Electrician.....	9 00
H. H. Jesser, Electrician.....	9 00
E. H. Collins, Electrician.....	9 00
W. L. Chamberlain, Electrician.....	9 00
L. Cereghino, Carpenter.....	9 00
G. R. Cowan, Carpenter.....	9 00
A. K. Crossman, Carpenter.....	9 00
R. F. Driscoll, Carpenter.....	9 00
W. B. O'Banion, Carpenter.....	9 00
W. H. Salmon, Carpenter.....	9 00
G. F. McMath, Carpenter.....	9 00
E. W. Leibert, Carpenter.....	9 00
M. A. McLeod, Carpenter.....	9 00
W. H. Dutcher, Carpenter.....	9 00
S. G. Pope, Carpenter.....	9 00
F. W. Gorham, Plumber.....	9 00
M. R. Johnston, Steamfitter.....	9 00
J. J. Allen, Tinner.....	9 00
W. R. King, Plasterer.....	9 00
Edward Kelly, Paver.....	9 00
Maurice Ahern, Paver.....	9 00
E. Ahern, Paver.....	9 00
C. O'Tools, Paver.....	9 00
J. W. Haskins, Pileman.....	9 00
J. F. McPherson, Pileman.....	9 00
C. H. Eisenhut, Pileman.....	9 00
F. H. Herrin, Raftsman.....	9 00
W. H. Connor, Raftsman.....	9 00
C. R. Hale, Piledriver Engineer.....	9 00
John McConville, Piledriver Engineer.....	9 00
W. Stelzariede, Piledriver Engineer.....	9 00
W. J. McMahon, Piledriver Engineer.....	9 00
P. D. Schweitzer, Pileman.....	9 00
L. F. Morris, Pileman.....	9 00
Wm. Nesbett, Pileman.....	9 00
J. C. Willis, Pileman.....	9 00
J. Loney, Pileman.....	9 00
H. H. Wentworth, Pileman.....	9 00
Jas. McCauley, Pileman.....	9 00
Daniel Kain, Pileman.....	9 00
F. A. Schirmer, Pileman.....	9 00
T. L. Hammill, Pileman.....	9 00
Daniel McGilvray, Pileman.....	9 00
G. Maynard, Pileman.....	9 00
J. J. Collins, Piledriver.....	9 00
R. D. Painter, Piledriver.....	9 00
O. T. Walling, Piledriver.....	9 00
C. H. Peebles, Piledriver.....	9 00
J. W. Brokaw, Piledriver.....	9 00
W. T. Wilshire, Piledriver.....	9 00
G. E. Witham, Piledriver.....	9 00
Tom Thomsen, Piledriver.....	9 00
C. J. Quinn, Piledriver.....	9 00
H. J. McGowan, Piledriver.....	9 00
Thos. Gosland, Piledriver.....	9 00
E. J. Bigley, Piledriver.....	9 00
T. J. Crawford, Piledriver.....	9 00
D. R. Pettingell, Piledriver.....	9 00
Rolie O'Neil, Piledriver.....	9 00
E. Kemmerling, Piledriver.....	9 00
A. G. Bray, Piledriver.....	9 00
Leo De Sella, Yardmaster.....	8 70
G. L. Rberts, Yardmaster.....	8 70
C. P. Allison, Yardmaster.....	8 70
W. P. Kennedy, Painter.....	8 50
W. C. Davis, Painter.....	8 50

†Part-time service.

BOARD OF STATE HARBOR COMMISSIONERS—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
J. J. O'Brien, Painter.....	8 50
F. R. Gantt, Painter.....	8 50
G. L. Autagne, Painter.....	8 50
J. Toomey, Painter.....	8 50
W. J. Driscoll, Painter.....	8 50
F. Benjamin, Glazier.....	8 50
James Nee, Rammer.....	8 00
M. P. Stanovich, Rammer.....	8 00
C. W. Armager, Locomotive Engineer.....	7 92
Geo. L. Bicknell, Locomotive Engineer.....	7 92
G. T. Black, Locomotive Engineer.....	7 92
J. R. Doyle, Locomotive Engineer.....	7 92
Manuel Garcia, Locomotive Engineer.....	7 92
S. F. Higgins, Locomotive Engineer.....	7 92
C. D. Ingersoll, Locomotive Engineer.....	7 92†
J. Leitner, Locomotive Engineer.....	7 92
J. E. Moorehead, Stevedore.....	7 06
R. N. Foster, Engine Foreman.....	7 60
J. E. Feeney, Engine Foreman.....	7 60
C. R. Gundaker, Engine Foreman.....	7 60
A. A. Haven, Engine Foreman.....	7 60
P. M. Kelly, Engine Foreman.....	7 60
J. A. Parlin, Engine Foreman.....	7 60
Fred Sanger, Engine Foreman.....	7 60
R. H. Seberg, Engine Foreman.....	7 60
L. J. Bergin, Boilermaker.....	7 20
F. W. Meisenbach, Boilermaker.....	7 20
L. R. Case, Machinist.....	7 20
E. J. Canepa, Machinist.....	7 20
J. F. Scullen, Machinist.....	7 20
F. D. Stevens, Machinist.....	7 20
C. L. White, Machinist.....	7 20
A. E. Engstrom, Coppersmith.....	7 20
W. C. Wilson, Crane Engineer.....	7 20
D. E. Bohn, Machinist.....	7 20
R. C. Byrne, Switchman.....	7 13
H. Christiansen, Switchman.....	7 13
M. R. Clonan, Switchman.....	7 13
G. E. Conover, Switchman.....	7 13
M. H. Cooley, Switchman.....	7 13
T. F. Curley, Switchman.....	7 13
Wm. Hartigan, Switchman.....	7 13
W. J. Harris, Switchman.....	7 13
Wm. Jordan, Switchman.....	7 13
Wm. Kelleher, Switchman.....	7 13
W. B. Knight, Switchman.....	7 13
J. D. Lobdell, Switchman.....	7 13
F. L. Mattice, Switchman.....	7 13
H. Michel, Switchman.....	7 13
F. C. Park, Switchman.....	7 13
E. E. Quinn, Switchman.....	7 13
J. J. Ray, Switchman.....	7 13
F. A. Robertson, Switchman.....	7 13
E. E. Stearns, Switchman.....	7 13
T. A. Wolfe, Switchman.....	7 13
C. D. Cooley, Switchman.....	7 13
E. Trotman, Switchman.....	7 13
Ora Platt, Switchman.....	7 13
W. E. Paulsell, Switchman.....	7 13
H. C. Padilla, Switchman.....	7 13
G. M. Haupt, Switchman.....	7 13
C. Lennon, Truck Driver.....	7 00
F. P. Perry, Millman.....	6 29
C. B. Brown, Locomotive Fireman.....	6 29
M. P. Connelly, Locomotive Fireman.....	6 29
J. A. Dukey, Locomotive Fireman.....	6 29
T. S. Mallin, Locomotive Fireman.....	6 29
D. J. McCarb, Locomotive Fireman.....	6 29
J. P. Ring, Locomotive Fireman.....	6 29
S. J. Balkeld, Locomotive Fireman.....	6 29
C. T. Sperry, Locomotive Fireman.....	6 29
W. W. Walker, Locomotive Fireman.....	6 29
D. A. Meyer, Locomotive Fireman.....	6 29
B. O. Frisbie, Locomotive Fireman.....	6 23
Michael McGowan, Section Foreman.....	6 03
M. H. Stender, Paint Sprayer.....	6 00

†Part-time service.

BOARD OF STATE HARBOR COMMISSIONERS—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
John McAninch, Oiler	6 00
M. J. Forbes, Cement Man	6 10
F. Gleeson, Electrician's Helper	6 00
J. S. Sullivan, Tinner's Helper	6 00
D. Trinsi, Machinist's Helper	5 52
G. E. Brown, Machinist's Helper	5 52
J. J. Fitzsimmons, Machinist's Helper	5 52
M. J. Hanley, Machinist's Helper	5 52
A. F. James, Machinist's Helper	5 52
G. F. Lacey, Machinist's Helper	5 52
A. E. Manter, Machinist's Helper	5 52
D. J. Murphy, Machinist's Helper	5 52
W. J. O'Neill, Machinist's Helper	5 52
W. Teague, Machinist's Helper	5 52
A. C. Tosich, Machinist's Helper	5 52
Edw. A. Vogt, Machinist's Helper	5 52
Geo. Wilkins, Machinist's Helper	5 52
John Lawless, Blacksmith's Helper	5 52
S. J. Charehs, Blacksmith's Helper	5 52
Geo. Dougherty, Tinner	5 52
Thomas Murray, Plumber's Helper	5 52
F. J. Cunane, Plumber's Helper	5 52
James Reynolds, Painter's Helper	5 50
T. F. Fay, Oiler's Helper	5 50
F. E. Church, Oiler's Helper	5 50
E. L. Sivyer, Plasterer's Helper	5 50
C. C. Morehead, Truck Driver	5 50
E. J. Walsh, Patcher	5 50
J. F. Creamer, Patcher	5 50
Jas. Richards, Laborer	5 00
J. E. Rigney, Laborer	5 00
John Carey, Laborer	5 00
John McDonough, Laborer	5 00
T. P. McCann, Laborer	5 00
J. H. Foucher, Laborer	5 00
C. F. Smith, Laborer	5 01
H. D. Fox, Laborer	5 00
Michael Barry, Laborer	5 00
Patrick Dever, Laborer	5 00
J. Eudler, Laborer	5 00
A. Watts, Laborer	5 00
P. Amadeo, Laborer	5 00
B. Webb, Laborer	5 01
John Ring, Laborer	5 00
John Mulhern, Laborer	5 00
E. V. Sullivan, Laborer	5 00
John McPake, Laborer	5 00
William Williams, Laborer	5 00
James Ryan, Laborer	5 00
T. Ward, Laborer	5 00
Fred Smith, Laborer	5 00
J. H. Dolan, Laborer	5 00
M. McCarthy, Laborer	5 00
E. Lauterbach, Laborer	5 00
C. P. Neel, Laborer	5 00
T. F. Roberts, Laborer	5 00
William Astride, Laborer	5 00
E. Riley, Laborer	5 00
E. Holden, Laborer	5 00
J. F. Moorehead, Laborer	5 00
J. M. Adams, Sectionman	5 00
M. Costello, Sectionman	5 00
Jeremiah Doody, Sectionman	5 00
M. J. Fay, Sectionman	5 00
Michael Fogarty, Sectionman	5 00
Robert Gethin, Sectionman	5 00
Camillo Gianettoni, Sectionman	5 00
John Gorham, Sectionman	5 00
Mark Heney, Sectionman	5 00
H. Hirrell, Sectionman	5 00
J. Hurley, Sectionman	5 00
J. A. Larson, Sectionman	5 00
Humphrey Lynch, Sectionman	5 00
T. E. Miles, Sectionman	5 00
T. Murphy, Sectionman	5 00
T. J. Maloney, Sectionman	5 00

†Part-time service.

BOARD OF STATE HARBOR COMMISSIONERS—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
B. Riordan, Sectionman	5 00
W. Shanahan, Sectionman	5 60
J. Thorpe, Sectionman	5 00
Michael Grady, Sectionman	5 00
J. J. Mullen, Sectionman	5 00
Fred Conrad, Sweeper	4 75
P. D. Hayes, Sweeper	4 75
John Hayes, Sweeper	4 75
Alfred Markey, Sweeper	4 75
W. J. Young, Sweeper	4 75
Manuel Vierra, Sweeper	4 75
J. Griffin, Sweeper	4 75
G. C. Jacobson, Sweeper	4 75
J. C. Foley, Boat Clerk	4 50
W. D. Perkins, Boat Clerk	4 51
J. W. Harrison, Boat Clerk	4 10
J. E. Heilman, Janitor	4 25
J. Dennis, Janitor	4 25
J. W. Byrne, Janitor	4 25
Jos. Corich, Janitor	4 25
J. A. Conway, Janitor	4 25
J. Connors, Janitor	4 25
W. C. Abernathy, Janitor	4 25
J. P. Murray, Janitor	4 25
P. J. Mahoney, Janitor	4 25
J. J. Quigley, Janitor	4 25
W. H. Wundus, Janitor	4 25
Jos. Delucchi, Janitor	4 25
Jos. Rizzo, Janitor	4 25
J. F. Sullivan, Toolkeeper	4 00

TEMPORARY OR EMERGENCY WORK.

Title of Officer or Employees	Total Wage
1 Law Clerk	\$150 00
5 Watchmen	2,143 34
2 Foreman Electricians	2,082 35
22 Electricians	14,722 63
1 Foreman Ship Carpenter	571 46
6 Ship Carpenters	1,964 00
1 Foreman Ship Caulker	107 52
3 Ship Caulkers	255 68
1 Piledriver Foreman	1,232 63
2 Hoisting Engineers	1,218 00
9 Pilemen	8,528 50
1 Steam Fitter	889 58
3 Stenographers	689 22
1 Tug Captain	284 23
1 Marine Engineer	231 94
1 Fireman—Tug	154 16
2 Deckhands—Tug	273 71
1 Head Leverman	241 15
1 Leverman	200 42
1 Fireman—Dredger	132 57
7 Deckhands	754 70
39 Switchmen	7,322 00
25 Locomotive Firemen	5,450 00
10 Machinists' Helpers	3,824 40
2 Machinist Mechanics	1,280 60
3 Boiler Makers	
1 Crane Operator	1,202 40
2 Clerks	1,650 00
1 Watchman	790 00
78 Sectionmen	16,746 75
Total	\$75,376 59

NOTE.—The above indicates the number of persons engaged for temporary or emergency work during the fiscal year ending June 30, 1920, and the total amount of wages paid.

BOARD OF HARBOR COMMISSIONERS.**Port of Eureka, Humboldt Bay, California.**

Board: President, W. H. H. Heckman; Commissioners, H. H. Woodcock, Adolph Ohman; Secretary, Fred B. Barnum; Harbor Master, S. S. Silkwood.

(Regular meeting, first Monday in each month.)

Eureka, California, February 3, 1921.

State Civil Service Commission, Sacramento, California.

Gentlemen: The Board of Harbor Commissioners, for the Port of Eureka, consists of three members according to Section 2567 of the Political Code. The personnel of the Board is as follows:

	Yearly Salary
W. H. H. Heckman.....	\$400 00
H. H. Woodcock	460 00
Adolph Ohman	400 00
S. S. Silkwood, Harbormaster.....	1,200 00

(Appointed as per Section 2570, Political Code.)

Fred B. Barnum, Secretary (Appointed as per Section 2571, Political Code)..... 1,000 00
This Board has no other appointees and at no time has it had temporary or emergency employees.

W. H. H. Heckman, President.

**BOARD OF STATE HARBOR COMMISSIONERS FOR THE BAY
OF SAN DIEGO.**

Ed. Willoughby, President; F. L. Richardson; William B. Gross, Secretary and Treasurer.

920 Eighth Street.

San Diego, California, February 16, 1921.

Report of the Board of (State) Harbor Commissions for the Bay of San Diego to the State Civil Service Commission of California.

Board of Harbor Commissioners for the Bay of San Diego, California.

William B. Gross, Secretary and Treasurer, wages average about \$46 a month.

Ed. Willoughby, Presiding Officer, wages average about \$20 a month.

Frank L. Richardson, wages average about \$20 a month.

F. L. Richardson, Attorney for the Board, salary \$15 a month.

Joseph Brennan, Harbor Master, serving without pay.

Rent per month for office, \$2.50.

Respectfully submitted.

STATE BOARD OF HEALTH.

(Report of officers and regular employees employed January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Dr. W. M. Dickie, Secretary of Board.....	\$375 00*
Ralph Hilscher, Director Sanitary Engineering Bureau.....	333 33
Dr. W. H. Kellogg, Director Communicable Diseases Bureau.....	333 33
Erwin J. Lea, Director Food and Drug Bureau.....	300 00*
Dr. Ethel M. Watters, Director Child Hygiene Bureau.....	300 00
Dr. Frank L. Kelly, Epidemiologist.....	300 00
Dr. Allen F. Gillilan, Health Officer.....	300 00
Dr. Gavin J. Teifer, Health Officer.....	300 00
Guy P. Jones, Morbidity Statistician.....	250 00
John C. Macfarland, Attorney.....	250 00*
Mrs. E. L. M. T. Thompson, Director Tuberculosis Bureau.....	250 00
Anna C. Jamme, Director Nurses Registration Bureau.....	250 00
C. H. McCharles, Chemist.....	250 00
Clyde F. Smith, Assistant Engineer.....	215 00
Mason E. Franklin, Assistant to the Secretary.....	200 00*
L. E. Ross, Registrar of Vital Statistics.....	200 00*
Edward T. Ross, Sanitary Inspector.....	200 00
Mrs. Elizabeth McManus, Social Service Director.....	200 00
May L. Donald, Chemist and Bacteriologist.....	200 00
Dr. Esther Rosencrantz, Supervising Physician Tuberculosis Bureau.....	200 00†
Aug. F. Glaive, Chemist.....	185 00
Wm. H. Gourley, Inspector, Foods and Drugs.....	185 00
Caroline M. Christianson, Financial Clerk.....	175 00
Kate S. Douglass, Assistant Inspector, Nurses.....	175 00
Linda E. Mitschke, Field Worker, Tuberculosis Bureau.....	175 00
Ida M. Theile, Field Worker, Tuberculosis Bureau.....	175 00
Al. P. Duffy, Inspector, Foods and Drugs.....	175 00

*Statutory

†Part-time service.

STATE BOARD OF HEALTH—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
C. B. Heizer, Inspector, Foods and Drugs.....	175 00
H. C. Peters, Inspector, Foods and Drugs.....	175 00
Robt. G. Wray, Inspector, Foods and Drugs.....	175 00
Ray F. Goudey, Chemist and Bacteriologist.....	165 00
Ida May Stevens, Assistant Epidemiologist.....	160 00
Mrs. E. K. Middlehoff, Senior Clerk.....	160 00
E. A. Reinke, Assistant Sanitary Engineer.....	150 00
Raymond J. Abernathy, Assistant to Director Foods and Drugs.....	150 00*
Mary K. Clary, Public Health Nurse.....	150 00
Mary A. Smeeton, Bacteriologist.....	150 00
Catherine A. Morrison, Stenographer to the Board.....	150 00
Mrs. Frieda Hodgkinson, Stenographer-Secretary.....	150 00
Mrs. Grace D. Naquin, Stenographer.....	150 00
H. R. Robbins, Inspector, Foods and Drugs.....	150 00
Assnath M. Tridel, Stenographer-Clerk.....	140 00
Lucie Jones, Statistician.....	135 00
Thelma C. Frederick, Deputy Statistician.....	133 33*
Florence B. Shackelford, Stenographer.....	133 33
Grace L. Black, Stenographer.....	130 00
Carmen Blessing, Parasitologist.....	125 00
Alice Potter, Bacteriologist.....	125 00
Viola R. Koreb, Bacteriologist.....	125 00
Mrs. Eleanor M. Fisher, Social Service Worker.....	125 00
Mrs. Amelia A. Meagher, Social Service Worker.....	125 00
Mrs. Augusta Fraser, Social Service Worker.....	125 00
Mrs. Freda K. Whyte, Social Service Worker.....	125 00
Mrs. Agnes P. Auhagen, Stenographer.....	125 00
Mrs. Mary E. Delpert, Stenographer.....	125 00
Mrs. Esta F. Galbraith, Stenographer.....	125 00
Gladys McMillan, Stenographer.....	125 00
Mrs. Mary E. Nichols, Stenographer.....	125 00
Alice O'Donnell, Stenographer.....	125 00
Linnie T. Ryan, Stenographer.....	125 00
A. D. Gaskin, Hollerith Machine Operator.....	125 00
Cornelius Herb, Assistant Bacteriologist.....	115 00
M. E. Jaffa, Nutrition Expert.....	100 00†
Dr. Alice M. Goetz, Social Hygiene Lecturer.....	100 00†
W. F. Langelier, Bacteriologist and Chemist.....	100 00†
Philip E. Rudolph, Technical Assistant.....	100 00
Lucy Powers, Laboratory Assistant.....	100 00
Ellen I. Hildebrandt, Stenographer.....	100 00
Chloe E. Dunn, Stenographer.....	100 00
Leila V. Chapman, Filing Clerk.....	100 00
Mrs. May G. Fish, Clerk.....	100 00
Mrs. Florence Kempthorne, Clerk.....	100 00
Mrs. Helena Richardson, Clerk.....	100 00
Edale O'Brien, Key Punch Operator.....	100 00
Daniel L. Connelly, Messenger.....	100 00
Constance M. Partsch, Stenographer.....	95 00
Mildred Coghill, Typist.....	90 00
Florence H. Pennish, Typist.....	85 00
Mrs. Metta C. Frederiksen, Transcriber.....	75 00*
Alma L. MacKinnon, Transcriber.....	75 00*
Mabel Chapman, Typist.....	75 00
Mrs. Elsa Giacomini, Laboratory Helper.....	75 00
Mrs. Ella H. Randall, Laboratory Helper.....	75 00
Dr. J. R. Snyder, Bacteriologist.....	50 00†
Marion D. Jones, Stenographer.....	50 00†
Hugh H. Forgeie, Animal Keeper, Hygienic Laboratory.....	30 00
Sina A. Vena, Laboratory Helper, per day.....	2 40†
M. Dorothy Beck, Laboratory Helper, per hour.....	45†
O. B. DeCamp, Laboratory Helper, per hour.....	45†
Essy N. Jeckell, Laboratory Helper, per hour.....	45†
Jos. Manildi, Laboratory Helper, per hour.....	45†
Glenn Shepherd, Laboratory Helper, per hour.....	45†
A. C. White, Laboratory Helper, per hour.....	45†

(Report of emergency employees employed by State Board of Health during fiscal year ending June 30, 1920.)

Number Employed and Position	Amount Earned
6 Stenographer-Typists.....	\$984 38
2 Clerks.....	228 08
5 Transcribers.....	550 29
2 Comptometer Operators.....	38 63
1 Hollerith Machine Operator.....	196 66

\$1,998 04

*Statutory.

†Part-time.

CALIFORNIA HIGHWAY COMMISSION.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
A. B. Fletcher, Highway Engineer.....	\$883 33*
C. C. Carleton, Attorney and Acting Secretary and Disbursing Officer.....	425 00
T. A. Bedford, Division Engineer.....	400 00
W. Lewis Clark, Division Engineer.....	400 00
Lester H. Gibson, Division Engineer.....	400 00
W. W. Patch, Division Engineer.....	400 00
F. G. Somner, Division Engineer.....	400 00
G. R. Winslow, Division Engineer.....	400 00
J. B. Woodson, Division Engineer.....	400 00
H. E. Warrington, Assistant Highway Engineer.....	400 00
T. E. Stanton, Assistant Highway Engineer.....	375 00
W. G. Hunter, Assistant Highway Engineer.....	350 00
R. H. Stalnaker, Assistant Highway Engineer.....	325 00
A. J. Wagner, Assistant Highway Engineer.....	325 00
W. J. Gough, Assistant Highway Engineer.....	325 00
S. V. Cortelyou, Assistant Division Engineer.....	325 00
N. D. Darlington, Commissioner.....	300 00*
G. C. Mansfield, Commissioner.....	300 00*
C. A. Whitmore, Commissioner.....	300 00*
F. H. Haselwood, Assistant Division Engineer.....	300 00
John H. Skeggs, Assistant Division Engineer.....	300 00
I. S. Voorhees, General Superintendent of Maintenance.....	300 00
A. B. Cleveland, Assistant Division Engineer.....	275 00
H. S. Comly, Assistant Division Engineer.....	275 00
S. T. Corfield, Assistant Division Engineer.....	275 00
Ralph E. Dodge, Office Engineer.....	275 00
C. F. Heintze, Assistant Division Engineer.....	275 00
C. V. James, Assistant Division Engineer.....	275 00
Robert E. Pierce, Assistant Division Engineer.....	275 00
S. S. Stahl, Assistant Division Engineer.....	275 00
Edw. E. Wallace, Assistant Division Engineer.....	275 00
H. B. Weaver, Chief Accountant.....	275 00
Chas. W. Backe, Assistant Division Engineer.....	250 00
A. W. McCurdy, Office Engineer.....	250 00
Fred T. Maddocks, Testing Engineer.....	250 00
J. Ogden Marsh, Office Engineer.....	250 00
H. D. Miller, Draftsman.....	250 00
J. G. Standley, Office Engineer.....	250 00
F. J. Bassett, Resident Engineer.....	235 00
Edw. Blockley, Chief of Party.....	235 00
S. D. Cowden, Resident Engineer.....	235 00
H. C. Darling, Assistant Division Engineer.....	235 00
T. H. Dennis, Resident Engineer.....	235 00
Wm. L. Hayes, Resident Engineer.....	235 00
B. H. Henry, Chief of Party.....	235 00
J. H. Kreidler, Resident Engineer.....	235 00
A. P. McCarton, Resident Engineer.....	235 00
J. C. North, Resident Engineer.....	235 00
John L. Piper, Resident Engineer.....	235 00
Lyle M. Ranson, Resident Engineer.....	235 00
H. C. Reeder, Resident Engineer.....	235 00
E. O. Sullivan, Resident Engineer.....	235 00
R. A. Tremper, Chief of Party.....	235 00
Geo. W. Wade, Resident Engineer.....	235 00
R. E. Ward, Chief of Party.....	235 00
J. J. White, Resident Engineer.....	235 00
C. N. Ainley, Resident Engineer.....	230 00
Herbert C. Foster, Resident Engineer.....	230 00
C. G. Kolster, Resident Engineer.....	230 00
W. H. Alderson, Draftsman.....	225 00
Clarence Bovey, Resident Engineer.....	225 00
N. J. Bowen, Chief of Party.....	225 00
Eugene B. Brown, Resident Engineer.....	225 00
E. M. Cameron, Resident Engineer.....	225 00
Dwight B. Cooper, Chief of Party.....	225 00
Earl K. Guion, Draftsman.....	225 00
Carl Hague, Draftsman.....	225 00
R. M. Haverstick, Chief of Party.....	225 00
J. A. McDavitt, Chief of Party.....	225 00
Wynn Meredith, Resident Engineer.....	225 00
C. J. More, Assistant Division Engineer.....	225 00
A. R. Morrison, Office Engineer.....	225 00
Geo. W. Null, Draftsman.....	225 00
Claud F. Price, Resident Engineer.....	225 00
Lowell R. Smith, Purchasing Agent.....	225 00
J. J. Stockard, Resident Engineer.....	225 00

*Statutory.

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
A. Swickard, Chief of Party.....	225 00
Ira G. Thomas, Office Engineer.....	225 00
Geo. A. Tilton, Jr., Resident Engineer.....	225 00
Clarence Woodin, Draftsman.....	225 00
Francis R. Baker, Resident Engineer.....	220 00
A. N. George, Resident Engineer.....	220 00
B. P. Lyons, Resident Engineer.....	220 00
R. E. Messner, Resident Engineer.....	220 00
C. P. Montgomery, Resident Engineer.....	220 00
Fay H. Allen, Draftsman.....	215 00
W. F. Bixby, Chief of Party.....	215 00
C. M. Butts, Resident Engineer.....	215 00
Eli Dallas, Draftsman.....	215 00
John B. Davidson, Draftsman.....	215 00
L. E. McDougal, Draftsman.....	215 00
Howard Noble, Chief of Party.....	215 00
Earl T. Scott, Resident Engineer.....	215 00
L. H. Williams, Draftsman.....	215 00
E. M. Muse, Photographer and Draftsman.....	210 00
Chas. H. Thomas, Chief of Party.....	210 00
J. O. Wanzer, Chief of Party.....	210 00
H. K. Ward, Assistant Resident Engineer.....	210 00
H. T. Avery, Draftsman.....	200 00
Howard K. Bane, Assistant Resident Engineer.....	200 00
Lloyd A. Batham, Draftsman.....	200 00
Cyrus W. Coffin, Chief Clerk.....	200 00
F. G. Darlington, Draftsman.....	200 00
F. E. Davis, Draftsman.....	200 00
Jas. F. Elwood, Draftsman.....	200 00
Wm. Faustman, Draftsman.....	200 00
Chas. U. Fontenau, Designing Engineer.....	200 00
Gordon G. Gale, Draftsman.....	200 00
Geo. C. Hansen, Draftsman.....	200 00
M. L. Hyde, Draftsman.....	200 00
Horace Ivie, Draftsman.....	200 00
T. F. McDonald, Clerk.....	200 00
Ransom C. Miles, Assistant Chief Accountant.....	200 00
W. C. Miller, Assistant Resident Engineer.....	200 00
Jas. A. Moriarty, Clerk.....	200 00
Harry Nelson, Resident Engineer.....	200 00
E. G. Poss, Resident Engineer.....	200 00
C. A. Potter, Resident Engineer.....	200 00
H. T. Reupke, Resident Engineer.....	200 00
H. W. Schreiber, Resident Engineer.....	200 00
F. J. Seadler, Draftsman.....	200 00
Wallace A. Smith, Assistant Engineer.....	200 00
M. E. Sparks, Secretary to Highway Engineer.....	200 00
D. C. Willett, Draftsman.....	200 00
F. N. Babb, Clerk.....	190 00
Robt. H. Harding, Resident Engineer.....	190 00
Palmer Holt, Draftsman.....	190 00
B. T. Millard, Resident Engineer.....	190 00
Chas. H. Ryan, Clerk.....	190 00
W. A. Smith, Assistant Resident Engineer.....	190 00
Wm. J. Thompson, Draftsman.....	190 00
Arthur Wallace, Assistant Resident Engineer.....	190 00
Edw. H. Wier, Draftsman.....	190 00
Bernard Anawalt, Instrumentman.....	185 00
Chas. R. Blood, Draftsman.....	185 00
O. D. Breuning, Assistant Resident Engineer.....	185 00
C. G. Burnett, Instrumentman.....	185 00
W. W. Compton, Instrumentman.....	185 00
A. Coonrod, Assistant Resident Engineer.....	185 00
W. D. Eaton, Assistant Resident Engineer.....	185 00
Wallace Peery, Resident Engineer.....	185 00
Wm. H. Ringen, Draftsman.....	185 00
C. M. Rosenberg, Resident Engineer.....	185 00
Ralph W. Sands, Bridgetender.....	185 00
E. L. Seltz, Instrumentman.....	185 00
J. Geo. Smith, Draftsman.....	185 00
Harvey Stover, Draftsman.....	185 00
W. K. Taylor, Assistant Resident Engineer.....	185 00
F. W. Teschke, Assistant Resident Engineer.....	185 00
Geo. W. Thompson, Assistant Resident Engineer.....	185 00
C. M. Tunison, Assistant Resident Engineer.....	185 00
Arthur F. Ager, Draftsman.....	180 00
Wm. S. Bascom, Draftsman.....	180 00
W. H. Johnson, Assistant Resident Engineer.....	180 00

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Fred W. Pettit, Draftsman	180 00
Beverly T. Ward, Draftsman	180 00
H. H. Wildy, Instrumentman	180 00
P. T. Alexander, Draftsman	175 00
F. K. Blue, Draftsman	175 00
Wm. Bock, Draftsman	175 00
Howard F. Briggs, Draftsman	175 00
Howard Briley, Draftsman	175 00
Ernest J. Brown, Assistant Resident Engineer	175 00
Edwin Carlstad, Instrumentman	175 00
James F. Cole, Instrumentman	175 00
R. R. Czeikowitz, Assistant Resident Engineer	175 00
C. C. Darrow, Clerk	175 00
Preston L. Fite, Assistant Resident Engineer	175 00
J. A. Gillilan, Draftsman	175 00
Douglas H. Greeley, Instrumentman	175 00
Chas. L. Greene, Draftsman	175 00
Rich. B. Holdsworth, Clerk	175 00
Emanuel Johnson, Instrumentman	175 00
Chas. W. Jones, Draftsman	175 00
E. F. Lippert, Draftsman	175 00
A. Roger McEwen, Instrumentman	175 00
Wm. McNeely, Draftsman	175 00
Fred P. Mesick, Draftsman	175 00
J. R. Meskimons, Draftsman	175 00
Horace S. Miles, Draftsman	175 00
Godwin C. Moore, Draftsman	175 00
John G. Moran, Instrumentman	175 00
L. D. Packard, Assistant Resident Engineer	175 00
Carl L. Rinnels, Draftsman	175 00
Geo. W. Rylander, Clerk	175 00
Seth W. Simpson, Instrumentman	175 00
Dock Sapp, Instrumentman	175 00
Geo. Sowash, Draftsman	175 00
Joseph E. Spink, Draftsman	175 00
J. E. Stewart, Draftsman	175 00
Elmer L. Stump, Draftsman	175 00
Clifford J. Tenby, Draftsman	175 00
James Upham, Draftsman	175 00
Earl G. Van Leeuwen, Draftsman	175 00
E. C. Weinsheimer, Draftsman	175 00
W. W. West, Draftsman	175 00
S. A. Moran, Instrumentman	170 00
Thos. F. Rodgers, Instrumentman	170 00
Lewis E. Wilson, Instrumentman	170 00
Joseph S. Fite, File and Contract Clerk	165 00
E. J. Kaleschke, Draftsman	165 00
Albert M. Nash, Draftsman	165 00
Joseph F. O'Hara, Draftsman	165 00
Irwin B. Ramsier, Draftsman	165 00
E. N. Sawtelle, Draftsman	165 00
A. E. Thompson, Draftsman	165 00
Chas. E. Thorp, Assistant Purchasing Agent	165 00
E. D. Breuning, Field Draftsman	160 00
R. N. Burgess, Draftsman	160 00
Mrs. Helen M. Davidson, Assistant Secretary and Assistant Disbursing Officer	160 00
Wm. T. Duffy, Instrumentman	160 00
Walter A. Eskilson, Draftsman	160 00
L. C. Evans, Assistant Resident Engineer	160 00
Katherine A. Feeny, Civil Service and Employment Clerk	160 00
H. O. Fletcher, Instrumentman	160 00
E. D. Gardner, Assistant Resident Engineer	160 00
Marshall H. Hubbs, Instrumentman	160 00
F. N. Hveem, Assistant Resident Engineer	160 00
L. L. Knight, Instrumentman	160 00
C. P. Martin, Field Draftsman	160 00
Mrs. Leona Duden Smith, Clerk	160 00
Don H. Van Zandt, Instrumentman	160 00
H. N. T. Bowden, Draftsman	155 00
R. P. Green, Draftsman	155 00
James T. Hays, Clerk	155 00
Harry Mounday, Laboratory Assistant	155 00
Harvey Sammons, Assistant Bridgetender	155 00
J. C. Wayne, Assistant Bridgetender	155 00
A. L. Anderson, Clerk	150 00
James A. Brown, Assistant File Clerk	150 00
Regis E. Halter, Levelman	150 00
Rebecca Hess, Draftsman	150 00
Carl Kinyon, Levelman	150 00
L. G. Marshall, Instrumentman	150 00

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
H. B. Melendy, Levelman	150 00
Willis Pepper, Draftsman	150 00
R. F. Reynolds, Field Draftsman	150 00
Clyde W. Rust, Assistant Resident Engineer	150 00
T. W. Voss, Draftsman	150 00
Ross E. Bissell, Field Draftsman	145 00
Nellie Diamant, Stenographer	145 00
Mrs. Cora L. Gascoigne, Bookkeeper	145 00
John W. Gray, Rodman	145 00
Chas. P. Sweet, Assistant Resident Engineer	145 00
G. R. Thompson, Clerk	145 00
Geo. D. Alexander, Draftsman	140 00
Florence Cameron, Stenographer	140 00
H. H. Hilderbrand, Computer	140 00
May I. Larkin, Assistant Accountant	140 00
Mattie K. McComber, Stenographer	140 00
F. R. Merrill, Draftsman	140 00
M. M. Newlan, Clerk	140 00
H. J. Pearce, Assistant Accountant	140 00
H. F. Balsz, Rodman	135 00
N. C. Casmore, Rodman	135 00
Sam Costello, Cook	135 00
Jas. D. Cooney, Instrumentman	135 00
L. G. Corey, Levelman	135 00
Wm. P. Devine, Rodman	135 00
W. W. Greer, Rodman	135 00
Julia V. Hague, Stenographer	135 00
W. H. Holman, Rodman	135 00
Mrs. L. J. Hoover, Cook	135 00
H. Glover Hughes, Draftsman	135 00
Herman Kastens, Cook	135 00
Kenneth Kirk, Chairman	135 00
J. P. McAndrews, Rodman	135 00
L. R. McNeely, Chairman	135 00
R. J. Nickerson, Rodman	135 00
Lloyd B. Reynolds, Draftsman	135 00
Oscar H. Rordorf, Field Draftsman	135 00
L. E. Roth, Rodman	135 00
Geo. Souza, Truckdriver and Chairman	135 00
B. W. Vinsonhaler, Rodman	135 00
Fred C. Volkman, Rodman and Truckdriver	135 00
Joseph A. Williams, Rodman	135 00
Helen A. Edwards, Clerk	130 00
Zula Andrews, Assistant Accountant	125 00
Emil Baruch, Clerk	125 00
Royal F. J. Becker, Assistant Draftsman and Computer	125 00
I. E. Cramer, Draftsman	125 00
W. J. C. Dinsmore, Superintendent	125 00
Donald T. Dozier, Rodman	125 00
Robert J. Frank, Clerk	125 00
Harry A. Frey, Chairman	125 00
Elmer W. Gardner, Chairman	125 00
Edmon L. Hobbs, Rodman	125 00
C. L. Jencks, Rodman	125 00
J. E. Kinyon, Rodman	125 00
Ira H. Loey, Rodman	125 00
Fay N. Loveless, Stenographer	125 00
Mary R. Lutenecker, Stenographer	125 00
S. Verne Lynn, Clerk	125 00
C. C. McCaleb, Clerk	125 00
R. D. Meredith, Draftsman	125 00
Ruth Mies, Stenographer	125 00
Benj. B. Moore, Chairman	125 00
C. C. Moore, Rodman	125 00
Verner Oleson, Rodman	125 00
Newton T. Pratt, Draftsman	125 00
W. J. Price, Rodman	125 00
Lida H. Ransom, Stenographer	125 00
Ralph Ridenour, Chairman	125 00
Van W. Rosendahl, Assistant Draftsman	125 00
Claude S. Simpson, Clerk-Stenographer	125 00
Mrs. Edna Taylor, Clerk	125 00
Garland Taylor, Clerk	125 00
Annie Thorburn, Stenographer	125 00
O. A. Troseth, Rodman	125 00
Fred D. White, Draftsman	125 00
Elizabeth Wolohen, Stenographer	125 00
Jos. M. Baroni, Rodman	120 00
Leslie F. Bertken, Rodman	120 00
O. G. Brown, Chairman	120 00

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
C. C. Buckman, Assistant Draftsman.....	120 00
R. P. Cann, Rodman.....	121 00
Jacob A. Carmichael, Chairman.....	120 00
P. A. Carmichael, Axman.....	120 00
Mrs. Stella T. Coster, Stenographer.....	120 00
Geo. W. C. Doherty, Rodman.....	120 00
Emma E. Field, Clerk.....	120 00
H. F. Gravitt, Chairman.....	120 00
J. P. Hanafin, Chairman.....	120 00
Esther E. Joss, Clerk.....	120 00
Mrs. L. D. Masson, Assistant Draftsman.....	120 00
Robt. V. Mattea, Chairman.....	120 00
C. D. Meredith, Cook.....	120 00
Raymond Miller, Chairman.....	120 00
Forest Norton, Rodman.....	120 00
Blanche Reynolds, Stenographer.....	120 00
Herbert Robinson, Chairman.....	120 00
Martin Schultz, Axman.....	120 00
Johanna Stein, Clerk.....	120 00
Lewis H. Stone, Chairman.....	120 00
H. A. Sutherland, Rodman.....	120 00
J. E. Waterhouse, Chairman.....	120 00
Muriel Yearin, Stenographer.....	120 00
Madeline Boylan, Clerk.....	115 00
Chester L. Caine, Assistant Draftsman.....	115 00
Sohn A. Case, Rodman.....	115 00
Mrs. Sara B. Gaillard, Stenographer.....	115 00
A. H. Leslie, Rodman.....	115 00
T. W. Loftus, Axman.....	115 00
Geo. E. McNeely, Assistant Draftsman.....	115 00
A. T. Moore, Axman.....	115 00
Mrs. P. M. Moynahan, Clerk.....	115 00
Rose Mulligan, Clerk.....	115 00
Mrs. Hilma B. Murray, Clerk-Stenographer.....	115 00
T. C. Reilly, Chairman.....	115 00
Mrs. Grace V. Stoughton, Stenographer.....	115 00
A. R. Smith, Axman.....	115 00
Esther O. Arvidson, Stenographer.....	110 00
Frank W. Gordon, Axman.....	110 00
H. M. Hiatt, Chairman.....	110 00
Alice Jordan, Stenographer.....	110 00
Florence Katz, Computer.....	110 00
Billy Lack, Clerk.....	110 00
W. D. Lyon, Chairman.....	110 00
Mrs. Mary M. McDonnell, Stenographer.....	110 00
T. Hilmar Nervig, Clerk.....	110 00
Mrs. E. M. Ritschel, Stenographer.....	110 00
Paul A. Russell, Rodman.....	110 00
Albert Strubinger, Assistant Draftsman.....	110 00
Mrs. Georgia Sullivan, Stenographer.....	110 00
Frank A. Butler, Assistant Blueprinter.....	105 00
Mrs. Nan Charter, Clerk.....	105 00
Mrs. Katie B. Cooper, Cook.....	105 00
Helen F. Duggan, Assistant Draftsman.....	105 00
Dorothy G. Jerauld, Clerk.....	105 00
Mrs. Marie H. Noble, Cook.....	105 00
Elizabeth Thompson, File Clerk.....	105 00
J. W. Albery, Bridgetender.....	100 00
Theresa C. Bernegg, Stenographer.....	100 00
Ida Dawson, Stenographer.....	100 00
Carrie R. Doherty, Stenographer.....	100 00
Myron E. Greer, Assistant Draftsman.....	100 00
Leona M. Lennox, Stenographer.....	100 00
Mrs. Vera B. Longfellow, Stenographer.....	100 00
L. S. Pierce, Assistant Draftsman.....	100 00
Wm. H. Warden, Jr., Clerk.....	100 00
R. D. Patton, Clerk.....	100 00
Laura Wheeler, Stenographer and File Clerk.....	100 00
Judith Younggren, Stenographer.....	100 00
Kenneth C. Zeiger, Assistant Resident Engineer.....	100 00
Mrs. Bertha Miller, Stenographer.....	95 00
Gladys Penner, Typist.....	95 00
Mrs. Mabel I. Ruiter, Clerk.....	95 00
Mrs. Meril B. Utery, Stenographer.....	95 00
Sayde Mae Best, Typist.....	90 00
Gladys M. Cole, Clerk.....	90 00
Claire Davenport, Stenographer.....	90 00
Mrs. Lulu Grove, Stenographer.....	90 00
Myrtle J. Morrison, Stenographer.....	90 00
Thos. Pearce, Assistant Draftsman.....	90 00

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Edith A. Ralston, Clerk	90 00
Bessie Stephane, Typist	90 00
Walter R. McLean, Laboratory Assistant	85 00
Harold Peacock, Assistant Draftsman	85 00
Winifred Thompson, Typist	80 00
Ima Vaughn, Typist	80 00
Charlotte Barnes, Clerk	75 00
Mrs. Alice Nathan, Switchboard Operator	75 00
C. C. Abersold, Bridgetender	50 00†
	Weekly Wage
H. S. Dolson, Shop Foreman	\$70 00
J. T. Haviland, Superintendent	65 00
Ed Rawson, Superintendent	65 00
Ralph W. Brown, Superintendent	63 00
J. I. Boaz, Superintendent	57 40
S. W. Lowden, Superintendent	55 00
L. H. Taylor, Superintendent	55 00
F. E. Burnside, Assistant General Shop Foreman	55 00
S. T. Myers, Foreman	50 00
J. W. Adams, Superintendent	50 00
V. C. Smith, Superintendent	50 00
H. T. Smith, Foreman	50 00
John Large, Foreman	50 00
Geo. H. Major, Superintendent	49 00
J. M. Watson, Foreman	46 20
Geo. W. Lane, Foreman	45 40
A. Hoefer, Timekeeper	43 40
W. B. Cannon, Superintendent	43 00
Wm. Archer, Foreman	42 00
J. E. Martindale, Subforeman	42 00
J. H. Clay, Foreman	42 00
W. J. Allen, Foreman	40 80
L. B. Prosper, Foreman	40 00
A. W. Schmuck, Foreman	40 00
F. M. Meisner, Superintendent	40 00
E. M. Maurer, Foreman	40 00
Hugh Henry, Foreman	40 00
P. Gahan, Foreman	39 00
C. M. Jackson, Foreman	39 00
A. Martinson, Foreman	39 00
R. P. Hamlin, Superintendent	39 00
J. A. McMullen, Foreman	38 50
Chas. A. Dally, Foreman	38 50
A. N. Jolliff, Foreman	38 40
F. K. Unsworth, Storekeeper	37 50
W. H. King, Foreman	37 10
J. W. Bell, Foreman	37 00
W. S. Rodgers, Foreman	36 10
Wm. Hampton, Foreman	35 00
D. J. Byers, Foreman	35 00
L. A. Vance, Foreman	35 00
C. G. Sackett, Foreman	35 00
Jos. Chiesa, Foreman	35 00
W. C. Hackman, Foreman	35 00
D. D. Breuning, Assistant Superintendent	35 00
G. T. Dexter, Timekeeper	35 00
W. A. Fraser, Timekeeper	35 00
W. J. Mellis, Timekeeper	35 00
R. O. Parker, Timekeeper	35 00
C. S. Grace, Timekeeper	35 00
O. F. Spahn, Timekeeper	35 00
Thos. J. Whalen, Foreman	33 25
J. S. Cano, Foreman	33 25
J. A. Mark, Foreman	33 25
W. B. Weathers, Foreman	33 25
E. S. Day, Foreman	32 90
Ed Wright, Foreman	32 90
J. C. O'Sooner, Foreman	32 00
E. G. Brassington, Foreman	32 00
W. V. Darling, Foreman	32 00
C. J. Ward, Foreman	32 00
Fred Grinnell, Timekeeper	32 00
Geo. B. Stevens, Timekeeper	32 00
H. B. Coleman, Foreman	31 50
Chas. A. Preston, Foreman	31 50
H. Washburn, Foreman	31 50
R. R. Davis, Foreman	31 50
H. L. Harmon, Foreman	31 50

†Part-time.

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Weekly Wage
Orville A. Eden, Timekeeper	31 40
R. R. Davis, Foreman	31 00
E. R. Samson, Foreman	30 00
Hurley Poppett, Foreman	30 00
A. Anderson, Foreman	30 00
Jas. A. Stauff, Foreman	30 00
E. Broughton, Foreman	30 00
R. P. Blake, Timekeeper	30 00
T. B. Landers, Timekeeper	30 00
W. J. Miller, Timekeeper	30 00
Y. R. Shields, Timekeeper	30 00
Nellie Knuckey, Stenographer	22 50
Helen S. Hendrickson, Stenographer	20 00
Opal W. Manaugh, Stenographer	18 00
	Daily Wage
F. C. Strauchauer, Superintendent	\$8 20
H. L. Montfort, Superintendent	8 20
G. T. Munson, Foreman Mechanic	8 00
H. B. Mulford, Foreman Mechanic	8 00
J. C. Paxson, Foreman Mechanic	8 00
O. F. Georges, Subforeman	8 00
J. A. Casson, Steam Engineer	8 00†
L. G. Shaffer, Foreman	7 70
B. W. Bickler, Superintendent	7 20
F. C. Macaulay, General Foreman	7 00
Geo. C. Nolte, General Foreman	7 00
C. Toole, Foreman	7 00
J. A. Casson, Foreman	7 00†
Wm. Archer, Foreman	7 00
A. S. Moore, Foreman	7 00
C. H. Burger, Foreman	7 00
R. A. Sinclair, Foreman	7 00
W. Day, Subforeman	7 00
R. P. Leibe, Subforeman	7 00
W. K. Reed, Superintendent	7 00
W. H. Miller, Superintendent	7 00
S. E. Harris, Superintendent	7 00
W. B. Albertson, Superintendent	7 00
W. L. Pyle, Plant Foreman	6 50
Geo. W. Ries, Grade Foreman	6 50
Harold Houston, Foreman	6 50
James Bryson, Subforeman	6 50
V. S. VerBryck, Subforeman	6 50
P. L. Hedrick, Subforeman	6 50
John Holm, Subforeman	6 50
J. D. Williams, Patrolman	6 50
E. C. Dozier, Timekeeper	6 40
B. H. Milliken, Foreman	6 20
J. S. Wagnon, Foreman	6 00
Ollie Rose, Foreman	6 00
Geo. Statton, Foreman	6 00
J. H. Gates, Foreman	6 00
Wm. Savercool, Foreman	6 00
A. W. McDonald, Foreman	6 00
Wm. Bigham, Foreman	6 00
P. A. Cox, Foreman	6 00
B. Fisher, Subforeman	6 00
Stephen Akers, Subforeman	6 00
J. C. Sanborn, Subforeman	6 00
C. W. Whitney, Subforeman	6 00
A. Stuckey, Subforeman	6 00
Tom Lawlor, Subforeman	6 00
Joe Dempsey, Subforeman	6 00
H. E. Egan, Superintendent	6 00
H. L. Leventon, Superintendent	6 00
J. F. Knapp, Superintendent	6 00
F. A. Carlock, Patrolman	6 00
Frank J. Massa, Foreman	5 90
Lewis Seymour, Timekeeper	5 70
O. G. Tyrer, Foreman	5 50
S. Crespo, Foreman	5 50
F. Walker, Foreman	5 50
H. Yatsie, Foreman	5 50
Robt. A. Carson, Foreman	5 50
R. W. McLellan, Foreman	5 50
S. R. Tong, Foreman	5 50

† Part-time.

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
R. L. Miller, Foreman.....	5 50
H. J. McKellops, Foreman.....	5 50
J. J. Phillips, Subforeman.....	5 50
G. B. Goddard, Subforeman.....	5 50
W. J. Butz, Foreman.....	5 45
J. W. Rodgers, Foreman.....	5 20
Mrs. R. R. Gilmore, Stenographer.....	5 00†
S. A. Martindale, Foreman.....	5 00
W. P. Hodgson, Foreman.....	5 00
R. Brennan, Foreman.....	5 00
Wm. Reynolds, Foreman.....	5 00
L. P. Laird, Foreman.....	5 00
A. D. Kipp, Foreman.....	5 00
W. H. Rush, Subforeman.....	5 00
Otto Miller, Subforeman.....	5 00
Andy Hauser, Subforeman.....	5 00
L. F. Rugg, Subforeman.....	5 00
K. Dietrich, Subforeman.....	5 00
R. E. Cook, Subforeman.....	5 00
A. E. Biscoe, Foreman.....	4 75
Peter J. Butz, Foreman.....	4 75
I. W. Musfield, Foreman.....	4 75
A. Fast, Subforeman.....	4 50
	Hour
Orrel G. Benson, Draftsman.....	6 75†
	Weekly Wage
1 Craneman—A. R. Snell.....	\$58 00
1 Truckdriver—G. M. Roe.....	42 00
1 Machinist—F. D. Holmes.....	42 00
2 Machinists—R. C. Cassels, L. Wayne.....	40 00
1 Mechanic—R. Johnson.....	39 00
15 Truckdrivers—H. M. Bauer, H. R. Booher, H. F. Gleason, T. R. Cotter, J. Tally, A. E. Sligh, C. Hasch, Wm. LaDevese, J. O. McReynolds, G. F. Mayerle, J. P. Mayerle, G. T. Davis, V. Strouse, E. Harter, J. Clanton.....	38 50
1 Cook—John Schroeder.....	38 50
2 Mechanics—S. Pritchard, L. Hogan.....	38 00
7 Flunkies—J. J. Lopez, J. Harrington, S. Brown, J. E. Farley, Ed. Slawter, B. Held, J. Pickett.....	37 09
2 Cooks—H. Giles, S. Alexander.....	36 40
1 Cook's Helper—John Wall.....	36 40
1 Guard—C. D. Kester.....	36 30
1 Cook—A. Snyder.....	35 90
2 Guards—W. F. Kehoe, Geo. Gulick.....	33 20
1 Baker—Ed. Johnson.....	32 40
1 Truckdriver—A. M. Brown.....	32 00
10 Mechanics—C. H. Berry, C. B. Barnes, R. Camacho, E. Read, F. Grinnell, G. B. Stevens, S. Dietrick, L. Schumaker, H. Erz, R. Leavitt.....	32 00
1 Truckdriver—H. E. Garriss.....	30 00
3 Mechanics—R. H. Hope, A. Bracemontes, Y. R. Shields.....	30 00
1 Cook—Ben Low.....	29 40
4 Mechanics—R. T. Stewart, I. P. Dean, L. Riley, S. Wheeler.....	28 00
1 Truckdriver—G. H. Chessman.....	26 00
2 Mechanics—E. Bassnot, G. Wender.....	26 00
8 Flunkies—C. Morgan, J. A. Pratton, H. Wiedel, W. M. Loy, C. Fleming, A. Galpin, B. Alexander, F. Ward.....	24 40
3 Mechanics—Wm. Fate, A. B. Custer, C. F. Hart.....	24 00
1 Mechanic's Helper—A. B. Custer.....	24 00
3 Flunkies—N. Fortune, G. Long, F. Willoughby.....	22 40
	Daily Wage
1 Shovel Engineer—B. Toohig.....	9 23
2 Plant Engineers—F. Miller, F. Mores.....	9 00
1 Rollerman—C. Kraft.....	9 00
1 Machinist—H. Sanders.....	8 60
1 Carpenter—W. O. Lowry.....	8 00
2 Blacksmiths—A. Hartwig, E. B. Hatch.....	7 50
6 Mechanics—B. Young, H. Bean, H. Crane, W. F. Mueller, L. Bixler, S. M. Small.....	7 20
1 Blacksmith—W. L. Lumry.....	7 00
2 Mechanics—A. Johnson, C. Woehl.....	7 00
7 Carpenters—C. Nelson, R. Marshall, C. Hagaman, W. Granlos, W. G. Walker, J. N. Whitman, M. Lucas.....	7 00
2 Engineers—L. Seates, F. Barnes.....	7 00
1 Mechanic—W. Farrisset.....	6 80
1 Truckdriver—R. S. Peck.....	6 50
2 Blacksmiths—E. Hogan, R. B. Harris.....	6 50
1 Machinist—F. Symms.....	6 50
9 Mechanics—J. S. Lemos, J. Brain, E. D. Fisher, C. Melville, F. Mendenhall, J. Still- well, F. Campbell, W. Small, D. Lindsay.....	6 50

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
1 Carpenter—G. Porter	6 50
1 Rollerman—C. Russell	6 50
1 Crusherman—E. Holmstrom	6 50
1 Welder—M. Stank	6 50
3 Mixermen—R. Byrrods, G. Briggs, O. F. Lindsay	6 50
1 Assistant Steam Engineer—J. C. Prawing	6 50
1 Mechanic—L. F. Beaulieu	6 40
1 Shovel Fireman—J. E. Toohig	6 35
11 Laborers—S. H. Anderson, C. L. Kack, J. Lambert, G. Johnson, M. Hogan, W. S. White, J. Binotto, F. Moss, R. Sopiccolo, J. Almadoba, J. Moresco	6 00
19 Truck Drivers—W. Pierce, T. Milligan, P. Johnson, F. B. Evers, H. D. Shelton, C. Svenberg, C. B. Bohman, J. Souza, F. W. Jones, M. Terry, E. J. Anthony, M. Helgren, H. C. Nutting, C. Johnson, S. J. Knapp, R. Weston, E. Shockley, F. A. Carlock, R. Hansen	6 00
3 Blacksmiths—H. Smith, A. R. Shelton, E. Kelly	6 00
3 Mechanics' Helpers—C. Brunett, P. O. Dody, R. A. Horton	6 00
17 Mechanics—B. Oliver, R. E. Pyle, R. Mott, H. E. Conroy, A. Schafer, J. Finnegan, H. Thomas, C. H. Jones, C. Byers, F. R. Harder, C. Brown, F. Eckman, R. Owens, J. L. Anderson, E. E. Foren, J. E. Shaw, H. M. Meisner	6 00
5 Carpenters—C. Rogers, G. Thomas, W. Barer, H. Strader, A. Croll	6 00
1 Painter—S. H. Kelso	6 00
5 Finishers—E. Bailey, W. Gohlke, W. Logan, E. Eyscheck, J. Noriegd	6 00
4 Rollermen—A. L. Cook, E. M. Shelton, F. R. Garrison, J. D. Byrnes	6 00
2 Tampers—R. Bucio, F. Ramirez	6 00
1 Heaterman—O. Patton	6 00
4 Headerboardmen—E. Edwards, P. Hartman, J. Kirk, P. Jones	6 00
1 Feeder—S. Tryer	6 00
1 Pipefitter—W. Johnson	6 00
3 Engineers—T. Oheney, J. Comstock, J. Brabant	6 00
1 Mixer Operator—L. Fowler	6 00
35 Laborers—C. Miller, F. Fenatto, A. E. Harmsen, F. Volkman, B. D. Forrest, C. Bovey, L. Brown, H. Byroads, J. Baker, W. Stice, A. E. Souza, W. Hanrm, J. Langer, J. Feliz, F. Pink, R. Watson, E. Larsen, T. Slate, G. Pearson, O. Stump, J. B. Carlson, A. Graham, J. J. Phillips, T. Marshall, F. Joseph, P. Kennedy, H. Grosser, G. Beach, J. Egan, T. Ridgeway, R. Griffin, T. Johnson, H. Feldman, J. Graham, J. Nesbitt	5 50
33 Truck Drivers—H. H. Adkins, O. A. Reinking, D. Gibson, F. J. Walsh, F. Wells, H. Wagon, A. C. Hendryx, R. O. Schoonover, N. W. Bullack, W. L. Butts, R. LaShange, H. Reed, A. B. Gale, C. E. Marshall, F. M. Walker, C. M. Sowash, C. D. Ham, E. Moyle, G. M. Gilmore, J. Stahl, N. L. Spence, W. E. Ware, N. W. Spencer, J. C. Davis, R. H. Luke, F. K. Romberg, R. B. Anderson, P. T. Beauchamp, H. Yatsie, A. B. Savage, J. F. Hollingsworth, R. E. Hawkins, R. W. Joseph	5 50
1 Blacksmith's Helper—O. Lofdahl	5 50
6 Mechanics—G. Pryor, P. M. Joseph, F. Jones, R. E. Dies, J. Rolls, P. Ziem	5 50
1 Carpenter—E. Corum	5 50
3 Gradenen—L. Boyer, C. G. Wright, A. M. Bayles	5 50
1 Spreaders—A. Louis, G. Rosenquist	5 50
2 Headerboardmen—B. Bradford, H. Adams	5 50
1 Pumpman—H. P. Harrison	5 50
1 Powderman—T. Riley	5 50
1 Mixer Engineer—B. Xaviez	5 50
2 Watchmen—Geo. J. Stevens, S. Spoulin	5 50
1 Cook—E. Johnson	5 31
6 Barrowmen—S. Enchas, T. Arrona, J. Rujis, I. Leiva, C. Jiminez, J. Sains	5 25
1 Dishwasher—W. A. Pripps	5 20
2 Cooks—E. McLannanham, J. A. Serviss	5 20
197 Laborers—T. Scott, M. Casillos, G. Seigart, O. Olsen, J. Komvat, J. Little, C. Thompson, W. H. Willingham, C. F. Hart, H. C. Hughes, F. Riley, C. Shields, S. C. Miller, E. P. Born, E. J. Meyers, F. G. Swan, H. V. Colburn, C. W. Marjory, T. McKinney, C. Bellamore, W. Woods, A. Longaere, A. Sorrels, F. Martin, T. McDonald, C. Bartsch, L. Wells, G. Ortis, B. Calvillo, J. Silvas, S. Mora, J. Castro, W. Bell, F. Rodriguez, F. Caro, W. Stewart, C. McCoy, W. Reed, S. Admire, L. Pittman, J. Morrall, H. Sinclair, D. Marshall, J. McDonald, A. Hansen, F. Barten, C. Peterson, D. O'Leary, N. Sadler, G. Bell, H. Nebin, B. Rhodes, P. McConnell, J. Webber, J. Barker, H. Barker, O. Breiden, W. Parysch, E. Nelson, J. O'Connell, J. Fowble, S. Wallace, J. Garcia, A. F. Ross, A. C. Rhoades, G. Keller, J. Morgan, W. F. Rhyn, G. C. Lear, B. Jones, G. W. Duffield, V. E. Joerger, W. Eickel, D. J. Bonnivert, P. P. Pingree, M. C. Bobo, W. M. Barnes, C. M. Barnes, A. Sane, H. A. Bright, C. E. Garner, J. Silveira, J. W. Morgan, L. Scharpp, C. Yorks, J. Poston, J. Calender, J. Woodsin, J. W. Medley, W. J. Ayers, R. Johnson, J. D. Cumley, D. Ruam, I. M. Underwood, E. Esse, C. W. Grupe, T. Kerrigan, M. Murray, J. Raffath, J. Thorpe, J. Berg, W. T. Aue, J. B. Van Arsdale, I. Sharp, F. Poston, H. Carter, M. Vas, F. Stubbe, J. McGlinchy, B. Salsarella, J. Coleman, J. V. Mannix, C. Garretti, F. Coronado, J. Dibbins, J. D. Martin, G. Rossi, C. Matta, J. Flores, F. Squeira, J. Martin, J. Squeira, H. White, M. I. Souza, W. Schumacker, W. J. Aretz, F. Hamm, R. Kynock, T. Nunes, F. Lecaire, W. Lerez, V. Anderson, A. Felix, C. Williams, H. W. Bazell, J. Mackey, S. F. Price, W. W. Chapman,	

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
J. Halkyard, M. L. Dever, N. O. Grass, O. D. Poston, G. B. Jones, S. M. Campbell, V. Guiseppe, T. Naziato, P. K. Miller, G. Bertucci, J. Taglaboie, J. Favino, A. Garcia, B. Quintanillo, R. Seoby, C. L. Cornish, J. Doron, C. Delnero, F. Minolotti, A. Zaffaroni, B. Chiarucci, G. Tucci, T. Birmingham, J. B. Boris, S. Papas, D. Mazzoni, J. J. Post, A. Bertolin, A. Petrelli, A. Lacatelli, T. D. Langston, W. J. Vollmero, J. Iacometti, O. R. Vollmers, J. Thompson, A. Wold, A. T. Walker, C. W. Post, A. W. Miller, J. Miller, R. Goldthorpe, O. K. Wilkinson, A. J. Shelton, H. Mensler, D. Kunkel, L. Davenport, E. C. Sweet, C. Kitko, P. L. Lockhart, I. H. Garrett, R. M. Sorenson, L. H. Frisbee, L. Larsen, B. H. Parks, I. E. Eastlick, G. H. Nutting, E. Tourte, F. Walker, C. Hamrick.	5 00
20 Truckdrivers—W. Purdj, E. Shiek, W. Cunningham, P. Lindsay, O. Lutz, T. Merrill, C. Reese, J. Struna, J. McLaughlin, E. Moshier, C. Christenson, W. Cordes, G. Trevehick, F. Sheldon, A. Vaile, W. Schisler, A. Winning, J. T. Shelton, D. Johnson, A. R. Johnson	5 00
1 Blacksmith—W. Tierney	5 00
2 Blacksmith's Helpers—W. N. Ennis, A. P. Paine	5 00
1 Mechanic's Helper—E. Wagoner	5 00
1 Carpenter's Helper—L. Gibbens	5 00
21 Mechanics—E. Knukey, H. Perrin, J. Roberts, P. Hoopes, T. Strongquist, E. Wachter, O. Williams, H. Scott, R. Chambers, R. Madden, B. Hamilton, H. Hoopes, G. Farrio, J. Scott, B. Hoopes, E. Ford, W. Karr, O. Garner, J. Garner, J. Stone, C. Wrench	5 00
1 Powderman—J. L. Wilson	5 00
1 Fireman—J. P. Immel	5 00
3 Watchmen—T. Almadoba, J. M. C. Smith, W. Park	5 00
1 Cook—H. O. Keffler	4 95
1 Laborer—R. Ricketts	4 90
59 Laborers—P. Ingomells, A. Rosalez, G. Wernett, J. Bernard, P. Mato, T. Murphy, M. Urias, R. Whitehead, J. Mato, F. Donovan, A. Zaragoza, J. Doyle, M. Barrera, G. McGinnis, L. Loya, E. Wilson, T. Gonzales, G. Taylor, M. Vassallo, Y. Velasques, J. Tejeda, P. Rodriguez, T. Pelajio, J. Chavez, F. Leizra, J. Sierra, A. Staff, M. Expinosa, O. Staff, J. Romo, C. Kolstrom, A. Denegas, R. Leon, A. Valdenbra, L. Renteria, M. Carasco, F. Hagen, P. Revers, J. Miller, H. Wooster, J. Cummings, J. Turner, J. Remire, J. Farr, A. Ramirez, D. Martinez, F. Blanco, R. Ramirez, W. Maringer, C. Opken, G. Wilson, A. Wilson, G. Ellsworth, J. Valdez, P. Apel, R. Williams, H. Warren, R. White, R. King	4 75
13 Teamsters—A. Regli, J. Lowell, W. Johnson, E. Russell, G. Kellen, G. Post, G. Schoept, O. McGowan, M. Cuddy, E. Anderson, A. Roach, F. Palmer, G. R. Vivian	4 75
1 Blacksmith—T. Asgood	4 75
2 Mechanics—W. Nieto, N. Valdez	4 75
1 Tamper—J. Pettit	4 75
1 Cook—H. Nugent	4 53 1/2
325 Laborers—W. C. Grant, R. H. Buckman, C. A. Thurow, A. J. Keehn, R. Johns, B. Smith, W. T. Crockett, R. Bogue, J. Burns, T. Merrifield, L. J. Emery, F. S. Emery, C. A. Sellars, E. Schumacher, G. Cook, W. A. Edgmon, J. Hoover, James Hoover, O. Haskins, O. M. Doolittle, C. Dickson, A. J. Jerry, C. E. Warren, T. H. Richardson, J. A. Allen, S. J. Rhodes, C. C. Jacobs, C. E. Harris, Oby Hopper, G. F. Harris, G. B. Robinson, C. Hopper, J. A. Gray, A. Hinckley, A. H. Harris, H. C. S. Evans, W. G. Carty, C. W. Gentry, E. W. Chester, J. L. Sinclair, S. A. Wyckoff, M. Klindra, L. Christiansen, Y. Requa, C. R. Talkington, W. Beinert, J. Slaughter, C. Miller, A. D. Berry, A. Z. Bonham, S. Finches, F. P. Cordray, W. H. Harmon, J. E. Branscomb, J. A. Dooley, J. M. Quinliven, T. Shea, M. D. Hack, C. L. Teel, J. Rauer, B. C. Hurt, O. Harmon, F. Coffron, W. Lewis, S. Barrisdale, J. Richey, M. Johnson, C. Shilling, J. K. Smith, J. Hanson, W. K. Ure, W. M. White, N. C. Terwilliger, C. Brown, G. F. Spittler, F. Mitchell, R. E. Mitchell, S. Pock, E. A. Davis, E. Wilson, J. N. Cunliffe, S. McCue, W. Luke, D. Luke, C. P. Bonsall, J. Purdon, E. B. Nichols, L. A. Frazee, L. Giannechini, B. J. Dashiell, B. Dashiell, P. Swenson, A. Rose, R. Robinson, M. A. Fritts, T. C. Hoag, J. De Bryce, A. Stange, W. Brown, J. B. Garner, J. R. Mullins, T. R. Miles, J. Dies, W. Stewart, F. J. Ford, J. E. Stevens, N. C. Burgess, H. J. Suxton, R. J. Leake, W. Garsties, E. W. Nix, E. Pearce, G. Angerina, A. E. Bristol, E. Sutter, R. E. Robinson, L. Ervin, J. T. Pearce, F. Stoltmann, F. M. Bradt, F. C. Wolfe, E. P. Conley, J. L. Allen, H. C. Beabout, F. Brown, S. J. Ervin, A. H. Leavitt, L. V. Andrews, B. T. Cuttleton, L. Gagliasso, R. Angulo, A. Wheeler, A. Sanchez, L. Cisneros, L. Yzaguirre, H. I. Reese, J. W. Wernett, G. W. Wernett, A. Elizalde, J. Artcas, J. Chaldez, S. Carreno, J. Briman, F. Saucher, M. Abila, J. Euelnas, M. Pina, R. Pina, I. Davison, H. O. McCune, C. R. Taylor, M. L. Davitt, D. E. Wilson, W. C. Magee, T. Rowten, H. Smith, S. Ireland, W. Bell, T. Burke, F. Wynn, A. Sponsler, O. Botkin, B. Terkey, G. Kennedy, L. Sims, H. Rowland, F. Lopez, W. Ryan, J. Kennedy, H. Graham, A. Montour, T. McCue, G. Brokaw, M. Kingston, J. Ross, G. Fisker, T. O'Hara, J. Miller, W. Evans, J. McDonald, W. Pace, A. Glenn, J. Barrett, L. McCury, C. Holroid, H. Christenson, F. Gibbons, C. Ditrer, C. Klefer, J. Rehaif, J. Nesbit, E. Bowman, F. Lacey, O. Dork, J. Light, J. Barner, A. Anderson, E. McDaniel, B. Converse, J. Snowdown, W. Chiswell, C. Averitt, H. Wright, J. Winfray, W. Roche, J. Murphy, J. Potter, F. Crawford, J. Anderson, J. Decker, P. Lane, W. Whalen, Wm. Lewis, J. Richey, Al. Shanger, F. Cusino, M. Lee, G. Wilson, V. Gitty, C. W. Strong, A. Hegeman,	

CALIFORNIA HIGHWAY COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
E. Vargas, J. Thorson, C. Carlson, S. Thompson, H. Christenson, H. Smith, V. Miller, G. Apogge, O. Lovefold, F. Valos, S. Schaefer, W. Weitz, S. Honer, H. Shields, J. Cervantes, E. Davis, C. Foord, W. Foord, L. Price, E. Requia, C. Hargreaves, G. Johnson, J. McCarty, T. Stillwell, J. Heidegger, R. Springett, O. Wheeler, F. Farewell, T. Kennedy, W. Leesha, E. Dardy, C. Black, J. Banfield, L. Miller, B. Hunter, F. Ginther, S. Jordan, T. Adams, J. Burrows, G. Brinman, F. Crager, A. Warren, E. Bennett, H. Davis, G. Garrett, R. Benny, B. Riggan, B. Baker, D. Wright, P. Miller, C. Bellows, J. McCarty, J. Craig, D. Morgan, L. Summers, E. Thompson, G. Wilson, H. Anderson, W. Kelly, E. Smith, B. Beach, D. Boteler, S. Swanner, F. Varela, J. Arenas, A. Mossberg, C. Shipman, H. Wilke, J. Bunton, W. Duyer, W. Amador, O. Parrish, H. Enders, M. Walker, J. Franklin, S. Bryan, G. Jones, J. Amador, W. Hoor, C. F. Gumels, G. H. Sherwood, M. H. Ayers, J. A. Rupe, H. Drake, O. Olsen, A. Rosso, C. Tindall, A. Arillanes, T. Blake, P. Pousse, J. Williams, I. Van Gordon, E. C. Kunge, J. Valenzuela, F. Miranda, P. Bronson, A. C. LeRoy, C. J. Sullivan, Wm. Boykin, J. Burns, L. Lugo, L. L. Wright, C. E. McCartney, J. A. Benton, J. E. Carey, J. Jacquez, P. Alvarez, J. C. Wheeler, J. Reid.	4 50
5 Teamsters—J. Washburn, A. S. Rice, W. Coffron, E. E. Beam, R. Fielder.	4 50
3 Mechanics—W. W. Drungler, E. Mason, L. Schroeder.	4 50
1 Gradenan—M. J. Curran.	4 50
1 Mechanic—L. N. King.	4 25
1 Laborer—W. B. Gorton.	4 25
47 Laborers—H. R. Overman, H. Dean, E. Romero, B. Vaughn, E. Woolfolk, F. Solus, M. Baldwin, H. Howe, R. A. Plant, F. Burgess, C. Conner, A. Felipe, L. D. Nichols, M. Francis, R. H. Carter, J. Pierpont, W. G. Taylor, T. Tyrer, A. McCain, T. Cleary, H. H. Scott, F. McDonald, J. P. Daniels, J. McCool, G. W. Juden, J. Solus, A. Morgan, C. Solus, D. Young, J. Burgess, C. H. Wayant, F. Francis, J. Hall, T. Cardoza, F. Kaufman, A. Tyrer, G. Ross, N. Chase, C. Henry, T. Little, R. Sugg, W. Tierman, J. Jacobs, W. Gantler, J. Burns, P. Lindemann, J. Hopper.	4 00
1 Mechanic—K. Twilling.	4 00
1 Flunkey—F. W. Davis.	4 00
10 Laborers—F. Osuna, W. Jackson, L. DeMille, E. Strauss, F. DeMill, C. Self, S. Martz, G. Bromley, R. Hielhouse, E. Thatch.	3 75
1 Laborer—E. V. Pitman.	2 50

CALIFORNIA HISTORICAL SURVEY COMMISSION.

Commission: Herbert E. Bolton, Edward A. Dickson, John F. Davis.

Officers: John F. Davis, Chairman; Owen C. Coy, Director and Archivist, 2847 Fulton street, Berkeley, California.

DOE LIBRARY, BERKELEY, February 3, 1921.

State Civil Service Commission, Sacramento, California.

GENTLEMEN: In accordance with your letter of January 28 we are sending you the following report.

(Officers and regular employees of California Historical Survey Commission on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Owen C. Coy, Director and Archivist	\$275 00
Hester Jordan, Stenographer (one-half time at \$90)	45 00

Employees of War History Department.

(Discontinued January 15, 1921.)

Genevieve Ambrose, Secretary	\$150 00
Garda K. Everton, Stenographer-Clerk	100 00

Temporary Employees for the Year Ending June 30, 1920.

Jno. W. Hall, Wrapping Books at 40 cents per hour	\$3 90
Mrs. Georgie Duffy, Stenographer at \$3 per day	6 00

Yours very truly, Owen C. Coy.

AGNEWS STATE HOSPITAL.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	\$301.00-\$350.00		Monthly Salary
Leonard Stocking, Medical Superintendent.....			\$333 33
	\$251.00-\$275.00		
E. W. Mullen, First Assistant Physician.....			270 00
	\$201.00-\$225.00		
J. A. Cutting, Assistant Physician.....			225 00
	\$151.00-\$175.00		
C. E. Smith, Business Manager.....			175 00
	Salary	Maintenance	
F. Coombs, Chief Engineer.....	\$145 00	\$19 00	164 00
G. B. Waterhouse, Secretary to Medical Superintendent.....	150 00	8 00	158 00
S. Swanson, Tractor Operator.....	120 00		
Moving Picture Operator.....	7 50	27 00	154 50
	\$126.00-\$150.00		
F. S. Burgess, Electrician.....	120 00	27 00	147 00
G. O. Cretser, Painter.....	120 00	27 00	147 00
J. O. Lippincott, Painter.....	120 00	27 00	147 00
W. H. Selby, Carpenter.....	120 00	27 00	147 00
J. H. Galligan, Farm Foreman.....	110 00	27 00	137 00
A. W. Saxe, Laundryman.....	110 00	27 00	137 00
J. H. Odlin, Fireman.....	105 00	27 00	132 00
G. W. Payton, Fireman.....	105 00	27 00	132 00
N. P. Pearson, Fireman.....	105 00	27 00	132 00
F. M. Jordan, Druggist and Musician.....			130 00
W. T. Dawson, Storekeeper.....	100 00	27 00	127 00
	\$101.00-\$125.00		
J. P. Holmes, Accountant.....			125 00
E. Schoof, Baker.....	\$110 00	\$11 00	121 00
E. H. Burns, Chief Cook.....			120 00
J. L. Darrell, Supervisor and Musician.....			120 00
A. L. Fitzgerald, Superintendent of Nurses.....			120 00
M. W. Thompson, Mason.....			120 00
F. McCloskey, Plumber.....			120 00
O. S. Wharton, Machinist.....			115 00
C. Cahill, Matron.....			110 00
S. W. Keaton, Upholsterer.....			107 00
F. G. Ferry, Assistant Vegetable Gardener.....	80 00	27 00	105 00
E. F. Mason, Fireman.....			102 00
F. W. McKenzie, Night Attendant.....	75 00	27 00	102 00
E. Scofield, Head Attendant.....	75 00	11 00	101 00
O. B. Anderson, Hydro Operator.....	90 00		
	\$76.00-\$100.00		
H. S. Whisman, Intern.....			100 00
Katherine Mosher, Clerk-Stenographer.....			100 00
R. Parks, Poultryman and Care of Swine.....			100 00
C. Koelmeyer, Landscape Gardener.....			100 00
Harry Hogan, First Assistant Cook.....			99 00
E. A. Carr, Meat Cutter.....	80 00	19 00	
G. H. Thompson, Head Attendant.....	75 00		
Band Leader and Musician.....	10 00	11 00	96 00
Herman Miller, Assistant Baker and Musician.....			95 00
G. H. Muller, Assistant Attendant and Musician.....	75 00	19 00	94 00
F. Escobar, Third Assistant Cook.....	80 00	11 00	91 00
J. W. Johnson, Assistant Land Gardener.....	80 00	11 00	91 00
F. J. Leslie, Head Attendant and Musician.....	80 00	11 00	91 00
W. N. Glenn, Assistant Supervisor.....			90 00
Mrs. F. Glenn, Assistant Matron.....			90 00
J. Scott, Vegetable Gardener.....			90 00
W. Henderson, Second Assistant Cook.....			90 00
O. Yocum, Hydro Operator.....			90 00
E. Neddersen, Surgical Nurse.....			88 00
R. Hyndman, Head Attendant.....	75 00	11 00	86 00
H. C. Holmes, Head Attendant.....	75 00	11 00	86 00
A. F. Meckenstock, Head Attendant.....	75 00	11 00	86 00
Mrs. L. Porter, Head Attendant.....	75 00	11 00	86 00
D. Perkins, Head Attendant.....	75 00	11 00	86 00
J. S. Phillips, Head Attendant.....	75 00	11 00	86 00

AGNEWS STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Salary	Maintenance	Monthly Salary
A. W. Chambers, Head Attendant.....	75 00	11 00	86 00
F. Wortham, Head Attendant.....	75 00	11 00	86 00
A. D. Stuart, Head Attendant.....	75 00	11 00	86 00
G. C. Armstrong, Night Attendant.....	75 00	11 00	86 00
R. G. Curry, Night Attendant.....	75 00	11 00	86 00
B. E. Ferry, Night Attendant.....	75 00	11 00	86 00
T. H. Miller, Night Attendant.....	75 00	11 00	86 00
P. P. Ruhde, Night Attendant.....	75 00	11 00	86 00
H. G. Beal, Night Attendant.....	75 00	11 00	86 00
J. Lamarra, Head Attendant.....	75 00	11 00	86 00
D. R. Thomas, Assistant Accountant.....			85 00
R. Bullock, Clinical Stenographer.....			80 00
C. E. Pruett, Clinical Stenographer.....			80 00
W. R. Sandage, Assistant Attendant.....	70 00	11 00	81 00
J. S. Simmons, Assistant Attendant.....	70 00	11 00	81 00
F. Eaglin, Assistant Attendant.....	70 00	11 00	81 00
J. Foley, Assistant Attendant.....	70 00	11 00	81 00
W. J. Weirich, Assistant Attendant.....	70 00	11 00	81 00
R. R. Sadler, Assistant Attendant.....	70 00	11 00	81 00
V. L. Hildreth, Assistant Attendant.....	70 00	11 00	81 00
C. Stroud, Assistant Attendant.....	70 00	11 00	81 00
A. L. Tilleman, Assistant Attendant.....	70 00		
Orchestra Leader and Musician.....	10 00		80 00
O. F. Miller, Head Attendant and Musician.....			80 00
H. O. Blake, Night Attendant and Musician.....			80 00
J. Carleton, Assistant Attendant.....	65 00	11 00	76 00
L. R. Larson, Assistant Attendant.....	65 00	11 00	76 00
C. C. McCormick, Assistant Attendant.....	65 00	11 00	76 00
G. L. Hoffman, Assistant Attendant.....	65 00	11 00	76 00
E. La Borde, Assistant Attendant.....	65 00	11 00	76 00
L. P. Wilson, Assistant Attendant.....	65 00	11 00	76 00

\$51—\$75.

E. Buckman, Chauffeur.....			75 00
N. P. Henriksen, Farm Hand.....			75 00
R. L. Jamison, Farm Hand.....			75 00
James Whalen, Deliveryman.....			75 00
A. Kaller, Deliveryman.....			75 00
J. L. Boynton, Seamstress.....			75 00
M. Jackins, Laundress.....			75 00
W. Morrison, Head Attendant.....			75 00
Mrs. A. Meckenstock, Assistant Attendant and Musician.....			75 00
George Stoner, Head Attendant.....			75 00
J. E. Jackson, Assistant Attendant and Musician.....			75 00
M. Wilhelmy, Assistant Attendant and Musician.....			75 00
A. C. Earll, Night Attendant.....			75 00
C. D. Murphy, Night Attendant.....			75 00
J. B. Pearce, Night Attendant.....			75 00
F. M. Quivey, Night Attendant.....			75 00
W. H. Summers, Night Attendant.....			75 00
W. R. Borreo, Night Attendant.....			75 00
M. B. Coleman, Night Attendant.....			75 00
T. Kyle, Night Attendant.....			75 00
B. S. McDaniel, Night Watch.....			75 00
Geo. Spain, Night Attendant.....			75 00
G. Meyers, Head Attendant.....			75 00
B. Berryman, Head Attendant.....			75 00
F. Meyer, Head Attendant.....			75 00
E. Pesch, Head Attendant.....			75 00
L. Foley, Head Attendant.....			75 00
M. Stevenson, Head Attendant.....			75 00
M. Wortham, Head Attendant.....			75 00
Ada Veal, Head Attendant.....			75 00
F. Puller, Head Attendant.....			75 00
M. Milner, Head Attendant.....			75 00
C. Gardner, Head Attendant.....			75 00
J. Albert, Night Attendant.....			75 00
A. Armstrong, Night Attendant.....			75 00
A. Ferry, Night Attendant.....			75 00
J. Hankins, Night Attendant.....			75 00
A. Kell, Night Attendant.....			75 00
L. Odlin, Night Attendant.....			75 00
P. Ruhde, Night Attendant.....			75 00
M. Watson, Night Attendant.....			75 00
M. Hagerty, Night Attendant.....			75 00
M. O'Rourke, Night Attendant.....			75 00

AGNEWS STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
B. McLean, Night Attendant.....	75 00
A. Stuart, Night Attendant.....	75 00
R. Eaglin, Head Attendant.....	75 00
Pearl Murphy, Head Attendant.....	75 00
L. H. Walker, Secretary, Board of Managers.....	70 00
G. Parkman, Shoe Repairer.....	70 00
E. La Borde, Laundry Help.....	70 00
I. Morrison, Assistant Attendant.....	70 00
J. Koelemeyer, Assistant Attendant.....	70 00
H. Thompson, Assistant Attendant.....	70 00
E. Leslie, Assistant Attendant.....	70 00
E. Perkins, Assistant Attendant.....	70 00
C. S. Goodman, Assistant Attendant.....	70 00
B. T. Farrell, Assistant Attendant.....	70 00
F. B. Burress, Assistant Attendant.....	70 00
J. B. Sammons, Assistant Attendant.....	70 00
Amy Barnes, Assistant Attendant.....	70 00
E. Johnson, Assistant Attendant.....	70 00
A. Harris, Assistant Attendant.....	70 00
W. Carey, Assistant Attendant.....	70 00
M. Short, Assistant Attendant.....	70 00
D. Simmons, Assistant Attendant.....	70 00
N. Peterson, Assistant Attendant.....	70 00
M. Hough, Assistant Attendant.....	70 00
D. Stroud, Assistant Attendant.....	70 00
E. Brown, Assistant Attendant.....	70 00
V. Sadler, Assistant Attendant.....	70 00
M. McLean, Assistant Attendant.....	70 00
C. Hildreth, Assistant Attendant.....	70 00
E. Goodman, Assistant Attendant.....	70 00
B. Gardner, Assistant Attendant.....	70 00
Z. Welrich, Assistant Attendant.....	70 00
L. Robinson, Assistant Attendant.....	70 00
E. Rutan, Assistant Attendant.....	70 00
L. Scott, Assistant Attendant.....	70 00
L. Emig, Assistant Attendant.....	70 00
J. Hartnett, Assistant Attendant and Musician.....	65 00
R. W. Kortright, Assistant Attendant.....	65 00
J. McGarry, Assistant Attendant.....	65 00
F. Hurley, Assistant Attendant.....	65 00
O. L. Mansell, Assistant Attendant.....	65 00
Iva Larson, Assistant Attendant.....	65 00
B. Luntsford, Assistant Attendant.....	65 00
S. McCormick, Assistant Attendant.....	65 00
G. Carleton, Assistant Attendant.....	65 00
A. Simonson, Assistant Attendant.....	65 00
V. Thomas, Assistant Attendant.....	65 00
N. Turk, Assistant Attendant.....	65 00
M. McCulloch, Assistant Attendant.....	65 00
M. Coakley, Assistant Attendant.....	65 00
F. McDonald, Assistant Attendant.....	65 00
D. Holmes, Assistant Attendant.....	65 00
Fdith Fullner, Assistant Attendant.....	65 00
G. Mansell, Assistant Attendant.....	65 00
Fva Hill, Assistant Attendant.....	65 00
N. Chambers, Assistant Attendant.....	65 00
H. Hoffman, Assistant Attendant.....	65 00
A. Wilson, Assistant Attendant.....	65 00
I. Darrell, Housekeeper.....	60 00
E. A. Smith, Telephone Operator.....	60 00
M. King, Waitress.....	60 00
H. A. Reichardt, Kitchen Vegetable Man.....	60 00
V. W. Buker, Assistant Attendant and Musician.....	60 00
F. Brewer, Assistant Attendant.....	60 00
R. Cook, Assistant Attendant.....	60 00
W. G. Courtis, Porter and Usher.....	55 00
H. F. McClellan, Mail Carrier and Usher.....	55 00
E. Olsen, Cook for Medical Superintendent.....	55 00
A. Phillips, Waitress Officers' Dining Room.....	55 00
L. Fretwell, Waitress Outside Employees' Dining Room.....	55 00
R. C. Hardy, Assistant Attendant and Musician.....	55 00
F. W. Marshall, Assistant Attendant.....	55 00
F. W. Kinkler, Assistant Attendant and Musician.....	55 00
V. Munson, Assistant Attendant.....	55 00
H. Youngren, Maid for Medical Superintendent.....	50 00
Julia Burrell, Cook-Maid for Assistant Physician.....	50 00
Susan Norton, Cook-Maid for Assistant Physician.....	50 00
C. Turk, Assistant Attendant.....	50 00
N. Soudage, Assistant Attendant.....	50 00

STATE OFFICERS AND EMPLOYEES.

MENDOCINO STATE HOSPITAL.

\$301.00 to \$350.00.

Name of Officer or Employee and Title	Monthly Salary
Robert Lewis Richards, Medical Superintendent-----	\$333 33
\$251.00 to \$275.00.	
M. J. Rowe, First Assistant Physician-----	270 00
\$201.00 to \$225.00.	
D. R. Smith, Second Assistant Physician-----	225 00
A. M. McIntire, Third Assistant Physician-----	225 00
\$176.00 to \$200.00.	
N. S. Burge, Business Manager-----	200 00
\$151.00 to \$175.00.	
E. C. Caffrey, Chief Engineer-----	170 00
\$126.00 to \$150.00.	
J. E. Thompson, Secretary-----	135 00
C. T. Roller, Chief Cook-----	131 00
\$101.00 to \$125.00.	
J. F. Trivett, Accountant-----	125 00
G. Spjuth, Upholsterer and Musician-----	115 00
J. A. Carmichael, Carpenter-----	121 00
Burt Gribbell, Plumber-----	110 00
F. L. Clark, Plumber-----	110 00
J. J. Murphey, Painter-----	121 00
G. T. Roos, Electrician-----	110 00
G. J. Butler, Supervisor-----	105 00
Ada G. Morton, Matron-----	105 00
W. E. Broadus, Druggist-----	111 00
L. J. Banks, Dairyman-----	111 00
W. E. Williams, Storekeeper-----	111 00
Jos. Richardson, First Assistant Cook-----	106 00
C. U. White, Laundryman-----	101 00
Virgil H. Long, Assistant Engineer-----	106 00
Geo. Garaventa, Vegetable Gardener-----	101 00
\$76.00 to \$100.00.	
Paul Eichenberger, Head Baker-----	100 00
Laura Roberts, Surgical Nurse-----	90 00
J. Laviletta, Second Assistant Cook-----	85 00
Paul Fredricks, Ranch Ward Cook-----	85 00
Chas. Vossberg, Assistant Baker-----	85 00
E. E. Frary, Farmer-----	90 00
Gertrude Elliott, Clinical Stenographer-----	85 00
Jack Brooks, Auto Truck Driver-----	85 00
Simon Liljeroth, Fireman-----	85 00
C. W. Orr, Fireman-----	85 00
B. C. Brown, Fireman-----	85 00
M. L. Gibson, Butcher and Slaughtering-----	80 00
E. L. McNeel, Attendant and Musician-----	91 00
T. B. Force, Charge Attendant-----	86 00
E. W. Husted, Charge Attendant-----	86 00
J. H. Laughlin, Charge Attendant-----	86 00
R. E. Martin, Charge Attendant-----	86 00
C. C. Rippey, Charge Attendant-----	86 00
J. Tuomey, Charge Attendant-----	86 00
R. C. Workman, Charge Attendant-----	86 00
J. A. Ramey, Night Attendant-----	86 00
G. H. Rothine, Night Attendant-----	86 00
Wallace Hill, Night Attendant-----	86 00
Lorena Benjes, Educational Instructress-----	86 00
N. Biegel, Poultryman-----	90 00
J. R. N. Roos, Business Manager's Clerk-----	86 00
W. E. Davis, Assistant Attendant-----	81 00
T. S. Gillooly, Assistant Attendant-----	81 00
H. F. Bonfield, Assistant Attendant-----	81 00
Wm. Suter, Assistant Attendant-----	81 00
F. E. Chance, Assistant Attendant-----	81 00
J. C. Bessom, Assistant Attendant-----	81 00
Clara Saulter, Assistant Attendant-----	81 00
Hazel E. Clark, Assistant Attendant-----	81 00
E. T. Kunzler, Milker-----	81 00
S. A. Macdonald, Cobbler and Picture Operator-----	78 50
Louis C. Grissom, Assistant Attendant-----	76 00
E. E. Smith, Assistant Attendant-----	76 00
Geo. H. Chandler, Assistant Attendant-----	76 00
Wm. J. Vassar, Farmhand-----	76 00
\$51.00 to \$75.00.	
J. Jorgensen, Relief Cook-----	75 00
Mrs. M. E. Buchler, Seamstress-----	75 00

MENDOCINO STATE HOSPITAL—Continued.

Name of Officer or Employee and Title	Monthly Salary
L. McDonnell, Assistant Laundryman	75 00
Harriet Reynolds, Laundress	70 00
J. T. Harrington, Charge Attendant	75 00
Marshall Mackenzie, Charge Attendant	75 00
M. D. Sauter, Charge Attendant	75 00
W. D. Jenkins, Night Attendant	75 00
Kirk Rohrbough, Night Attendant	75 00
C. D. Reaves, Night Attendant	75 00
Peter Jones, Night Attendant	75 00
J. E. Lowmes, Night Attendant	75 00
W. F. Hicks, Night Attendant	75 00
H. R. Greene, Night Attendant	75 00
Glenn Cutler, Assistant Attendant and Musician	75 00
Geo. H. Roberts, Assistant Attendant and Musician	75 00
W. M. Clark, Assistant Attendant and Musician	75 00
E. M. Hansen, Assistant Attendant and Musician	75 00
Mrs. M. O. Coddington, Charge Attendant	75 00
Cora Davis, Charge Attendant	75 00
Jessie Barnes, Charge Attendant	75 00
Nina P. Miller, Charge Attendant	75 00
Bessie Ramey, Night Attendant	75 00
Lillian Flaherty, Night Attendant	75 00
Mrs. A. Rothine, Night Attendant	75 00
Ethel Rohrbough, Night Attendant	75 00
Marie P. Hicks, Night Attendant	75 00
F. F. Greene, Assistant Dairyman	75 00
Mrs. F. C. Lind, Stenographer	75 00
Geo. S. Van Aken, Assistant Bookkeeper	75 00
W. D. Akers, Assistant Attendant	70 00
A. L. Van Aken, Assistant Attendant	70 00
Wm. Briggs, Assistant Attendant	70 00
John Ginochio, Assistant Attendant	70 00
Mrs. E. Harrington, Assistant Attendant	70 00
Mrs. Ovie Satterfield, Assistant Attendant	70 00
Mrs. E. McNeel, Assistant Attendant	70 00
Mrs. L. Rippey, Assistant Attendant	70 00
E. L. Roberts, Assistant Attendant	70 00
F. O. Strong, Assistant Attendant	70 00
E. L. Miller, Assistant Attendant	70 00
Mrs. E. Laughlin, Assistant Attendant	70 00
Mrs. E. Tuomey, Assistant Attendant	70 00
W. P. McHenry, Assistant Attendant	70 00
P. L. Satterfield, Assistant Attendant	70 00
W. L. Dillon, Assistant Attendant	70 00
Mrs. Lena Pilerak, Assistant Attendant	70 00
Mary F. Dillon, Assistant Attendant	70 00
Mrs. S. Husted, Assistant Attendant	70 00
Mrs. J. H. Martin, Assistant Attendant	70 00
Mrs. V. Mackenzie, Assistant Attendant	70 00
Miss Alta Copsey, Assistant Attendant	70 00
Mrs. Marion Bessom, Assistant Attendant	70 00
Mrs. G. Flynn, Assistant Attendant	70 00
Mrs. Maude P. Roberts, Assistant Attendant	70 00
Mrs. Marie Grissom, Assistant Attendant	70 00
Mrs. Rachael Suter, Assistant Attendant	70 00
U. G. Gay, Assistant Vegetable Gardener	70 00
J. F. Galvin, Treasurer	70 00
Gottlob Kramer, Landscape Gardener	70 00
Henrietta Gillooly, Waitress, A. D. R.	65 00
Jas R. Carey, Assistant Attendant	65 00
Homer H. Barnes, Assistant Attendant	65 00
H. C. Denham, Assistant Attendant	65 00
M. P. Adecock, Assistant Attendant	65 00
Chas. Kramer, Assistant Attendant	65 00
R. W. Crader, Assistant Attendant	65 00
Wm. Elliott, Assistant Attendant	65 00
Miss Kathryn Smith, Assistant Attendant	65 00
Mrs. Pearl Denham, Assistant Attendant	65 00
Mrs. Anna Smith, Assistant Attendant	65 00
Mrs. Anna Crader, Assistant Attendant	65 00
Mrs. Madelaine Kramer, Assistant Attendant	65 00
Mrs. Mabel Chandler, Assistant Attendant	65 00
Oscar Day, Farm Hand	65 00
D. Morchio, Farm Hand	65 00
C. F. Stovall, Farm Hand	65 00
Jas. R. Brower, Farm Hand	65 00
S. Garaventa, Farm Hand	65 00
Norman G. Todd, Kitchen Helper	71 00
Alice Copsey, Assistant Attendant	60 00
Mrs. G. M. Stern, Telephone Operator and Musician	60 00
Blanche L. Greene, Telephone Operator and Musician	60 00
Mrs. J. Trivett, Waitress, O. D. R.	55 00
Leona Chapman, Cook, Medical Superintendent	55 00
Jeanetta M. Wooster, Cook, First Assistant Physicians	50 00
Estelle S. Rea, Cook, Second Assistant Physicians	50 00
K. Chapman, Houseman, Medical Superintendent	50 00

NAPA STATE HOSPITAL.

(Employees and salaries, inclusive of maintenance as at January 1, 1921.)

Imola, California

Name and Position	Amount
A. C. Matthews, Acting Medical Superintendent	\$390 00
E. F. Donnelly, Physician Assistant	350 00
J. B. Rogers, Physician Assistant	350 00
Eva Rawlings, Physician Assistant	285 00
Geo. W. Ogden, Physician Assistant	300 00
A. S. Tong, Private Secretary	260 00
Ethel Dale Owen, Physician	230 00
Owen Duffy, Business Manager	200 00
T. H. Soehren, Business Manager Assistant	185 00
Ernest Royce, Druggist	195 00
A. Schaffler, Chef	175 00
E. C. Lathey, Auto Mechanic	155 00
Geo. Steventon, Blacksmith	155 00
H. E. Roper, Carpenter Foreman	165 00
F. C. Farnell, Carpenter	155 00
F. M. Jordan, Carpenter	155 00
N. W. Marble, Carpenter	155 00
H. A. Smith, Carpenter	155 00
H. W. Summers, Electrician	155 00
Wm. Berriman, Mason-Foreman	165 00
P. H. Grub, Mechanic-Rock Crusher	155 00
J. A. Kennedy, Plumber	155 00
Wm. T. McKenzie, Plumber	155 00
H. H. Warren, Plumber	155 00
H. L. Brantley, Painter-Foreman	165 00
T. H. Grady, Painter	155 00
J. D. Maier, Tinsmith	155 00
Sam Ewing, Upholsterer	155 00
Rod McKenzie, Foreman of Farms	170 00
J. F. Mlejnek, Baker	165 00
Owen Murray, Supervisor	150 00
Jennie G. Potter, Matron	150 00
R. Ackerman, First Cook	140 00
J. B. Anderson, Second Cook	130 00
N. T. McArthur, Bacteriologist	135 00
P. J. O'Hare, Storekeeper	140 00
Nancy N. Hicok, Work Therapist	130 00
F. T. Hoburg, Laundryman	145 00
C. J. Allement, Mechanic	130 00
A. H. McMonagle, Steamfitter	144 00
W. Giauque, Fireman	140 00
John McGuire, Fireman	140 00
C. N. McKenzie, Fireman	140 00
Dave Moore, Auto Truck Driver	135 00
Frank Alpine, Third Cook	120 00
F. Presbury, Fourth Cook	120 00
Margaret Elms, Extra Cook	120 00
Jas. W. Henry, Night Cook	110 00
H. S. Harrington, Butcher	110 00
Eliz Kerchem, Food Supervisor	110 00
T. J. Fisher, Chauffeur	120 00
Geo. F. Strohl, Dairyman	185 00
W. H. Gordon, Chief Engineer	230 00
Minnie Reynolds, Assistant Bookkeeper	120 00
Lulu Boke, Bookkeeper	120 00
Maud Davis, First Assistant Matron	125 00
Mae McMonagle, Night Matron	120 00
Tillie Allison, Stenographer and Dictophone Operator	110 00
May Ahern, Stenographic Clerk	120 00
Sarah S. Bryan, Stenographer	115 00
G. M. Fitzgerald, Stenographer	110 00
Lynn B. O'Brien, Stenographer	120 00
J. I. Bickell, Assistant Supervisor	125 00
G. A. Thorne, Night Supervisor	120 00
Edythe Miller, Assistant Work Therapist	120 00
E. P. Anglim, Head Attendant	110 00
J. Caven, Head Attendant	110 00
L. Enlow, Head Attendant	110 00
J. P. Howe, Head Attendant	110 00
F. Hulett, Head Attendant	110 00
E. Ingram, Head Attendant	110 00
J. Kane, Head Attendant	110 00
D. Martin, Head Attendant	110 00
J. Matejack, Head Attendant	110 00
S. D. McDaniel, Head Attendant	110 00
F. W. McGarry, Head Attendant	110 00
Wm. Noder, Head Attendant	110 00

NAPA STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Position	Amount
M. N. Richards, Head Attendant	110 00
J. C. Schlegel, Head Attendant	110 00
T. Shanahan, Head Attendant	110 00
G. H. Speak, Head Attendant	110 00
M. Shanahan, Head Attendant	110 00
W. H. Townsend, Head Attendant and Supervisor	115 00
D. L. Thomason, Head Attendant	110 00
S. D. Young, Head Attendant	110 00
Jas. Allen, Assistant Attendant	105 00
H. J. Benjamin, Assistant Attendant	105 00
C. J. Cornelius, Assistant Attendant	105 00
L. S. Coombs, Assistant Attendant	105 00
G. P. Carr, Assistant Attendant	105 00
A. Dittmar, Assistant Attendant and Rock Crusher	110 00
J. R. Eustace, Assistant Attendant	105 00
P. Feliz, Assistant Attendant	105 00
F. C. Foley, Assistant Attendant	105 00
A. E. Guillems, Assistant Attendant	105 00
J. Grady, Assistant Attendant	105 00
J. A. Hall, Assistant Attendant	105 00
P. Hinricks, Assistant Attendant	105 00
A. J. Hayes, Assistant Attendant	105 00
F. Hinricks, Assistant Attendant	105 00
J. W. Higgins, Assistant Attendant	105 00
B. F. Hildebrand, Assistant Attendant	105 00
Benj. Holley, Assistant Attendant	105 00
T. J. Knight, Assistant Attendant	105 00
H. S. Jansen, Assistant Attendant	105 00
J. M. Manion, Assistant Attendant	105 00
J. H. Nunn, Assistant Attendant	105 00
Ed. O'Hagan, Assistant Attendant	105 00
Q. E. Radford, Assistant Attendant	105 00
E. M. Roberts, Assistant Attendant	105 00
F. A. Schaffer, Assistant Attendant	105 00
Wm. Scully, Assistant Attendant	105 00
Pearl Schaffer, Head Attendant	99 00
E. R. Arnold, Assistant Attendant	105 00
Alma Vogt, Head Attendant	99 00
B. Sewell, Assistant Attendant	105 00
J. Sheanon, Assistant Attendant	105 00
T. V. Stanton, Assistant Attendant	105 00
J. Silva, Assistant Attendant	105 00
E. P. Thilgen, Assistant Attendant	105 00
A. J. Vanderhoof, Assistant Attendant	105 00
C. Walter, Assistant Attendant	105 00
C. L. Wade, Assistant Attendant	105 00
C. O. Wright, Assistant Attendant	105 00
J. Whelan, Assistant Attendant	105 00
L. M. White, Assistant Attendant	105 00
R. Bailey, Assistant Attendant	110 00
M. B. Basset, Assistant Attendant	110 00
H. E. Bishop, Assistant Attendant	110 00
W. E. Brennan, Assistant Attendant	110 00
F. W. Bloom, Assistant Attendant	110 00
C. Butler, Assistant Attendant	110 00
Ed Fitzgerald, Assistant Attendant	110 00
P. E. Fowler, Assistant Attendant	110 00
A. B. Hefflin, Assistant Attendant	110 00
L. A. Hill, Assistant Attendant	110 00
E. A. Hewitt, Assistant Attendant	110 00
H. E. Jewett, Assistant Attendant	110 00
N. Mayan, Assistant Attendant	110 00
I. C. Neeley, Assistant Attendant	110 00
W. H. Smith, Assistant Attendant	110 00
E. B. Orman, Assistant Attendant	110 00
R. C. Shannon, Assistant Attendant	110 00
Helen Atwood, Head Attendant	110 00
Edith Bickell, Head Attendant	110 00
Maizie Cuff, Head Attendant	110 00
May Eustace, Head Attendant	110 00
Mary Finley, Head Attendant	110 00
Mable Guillems, Head Attendant	110 00
Abbie Halterman, Head Attendant	110 00
Lillian Holden, Head Attendant	110 00
Maizie Howe, Head Attendant	109 00
H. S. Keck, Head Attendant	115 00
Annie Lornergan, Head Attendant	110 00
F. M. Lane, Head Attendant	115 00
Emma Moody, Head Attendant	110 00

NAPA STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Position	Amount
Effa McDaniel, Head Attendant and R. N.	109 00
Emma McFadden, Head Attendant	110 00
Mabel Nelson, Head Attendant	110 00
Ada Phillips, Head Attendant	104 00
Estelle Rudduck, Head Attendant	110 00
Kate Sutherland, Head Attendant	110 00
Clara Thrasher, Head Attendant	110 00
Florence Thomason, Head Attendant	110 00
Anna Van De Leur, Head Attendant and Supervisor	115 00
Hope Watkins, Head Attendant	110 00
Alice Bondson, Assistant Attendant	105 00
Kate Bragg, Assistant Attendant	105 00
Mary Burge, Assistant Attendant	105 00
Oma Brotherton, Assistant Attendant	105 00
Ora Bradley, Assistant Attendant	105 00
Mary Blaylock, Assistant Attendant	105 00
Nellie Buckley, Assistant Attendant	105 00
Grace Cassady, Assistant Attendant	105 00
Rose Chenette, Assistant Attendant	105 00
Emily Caeilkowitz, Assistant Attendant	105 00
Cora Conrey, Assistant Attendant	105 00
Margaret Dobbs, Assistant Attendant	105 00
Anna Gustavason, Assistant Attendant	105 00
Albine Grassman, Assistant Attendant	105 00
Nellie Harrison, Assistant Attendant	105 00
Lucy Hawkins, Assistant Attendant	105 00
Roy L. Hughes, Assistant Attendant	105 00
Minnie L. Hitt, Assistant Attendant	105 00
Edna Kelley, Assistant Attendant	105 00
Mena Kern, Assistant Attendant	105 00
Ernest Mosher, Assistant Attendant	105 00
Kate Mlejnek, Assistant Attendant	105 00
Martha Mitchell, Assistant Attendant	105 00
Florence Murray, Assistant Attendant	105 00
Leeta McCabe, Assistant Attendant	105 00
Margaret McDowell, Assistant Attendant	105 00
Princess McGrady, Assistant Attendant	105 00
Albine Navoni, Assistant Attendant	105 00
Loretta O'Neill, Assistant Attendant	105 00
Merry Prewett, Assistant Attendant	105 00
Mollie Prefater, Assistant Attendant	105 00
Ethel Patton, Assistant Attendant	105 00
Susie Provoncal, Assistant Attendant	105 00
Mary Quinn, Assistant Attendant	105 00
Lou Robinson, Assistant Attendant	105 00
C. Rowland, Assistant Attendant	105 00
Florence Riley, Assistant Attendant	105 00
Leonora Reinhart, Assistant Attendant	105 00
Elsie Simmons, Assistant Attendant	105 00
Henrietta Simpson, Assistant Attendant	105 00
Clara Schier, Assistant Attendant	105 00
Marie Sorenson, Assistant Attendant	105 00
Thos. Speak, Assistant Attendant	105 00
Cuba St. John, Assistant Attendant	105 00
R. E. Stover, Assistant Attendant	105 00
Margaret Swain, Assistant Attendant	105 00
Mollie Switzer, Assistant Attendant	105 00
Pearl Spinner, Assistant Attendant	105 00
Lucille Tarro, Assistant Attendant	105 00
Luetta Taylor, Assistant Attendant	105 00
Virginia Thompson, Assistant Attendant	105 00
L. B. Vogt, Assistant Attendant	105 00
Anna Wees, Assistant Attendant	105 00
Emma Wilson, Assistant Attendant	105 00
Anna Wildey, Assistant Attendant	105 00
Ella Atherton, Assistant Attendant	110 00
Vivian Dean, Assistant Attendant	110 00
Cora Everts, Assistant Attendant	110 00
Gert Grub, Assistant Attendant	110 00
Mary Green, Assistant Attendant	110 00
Jennie Gray, Assistant Attendant	110 00
Olive Guidry, Assistant Attendant	110 00
E. Hartwell, Assistant Attendant	110 00
E. Haven, Assistant Attendant	110 00
R. W. Hatherill, Assistant Attendant	110 00
Rose Hamton, Assistant Attendant	110 00
Kathleen Hill, Assistant Attendant	110 00
Cordelia Korch, Assistant Attendant	110 00
Louise Lathey, Assistant Attendant	110 00

NAPA STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Position	Amount
Gert. Montgomery, Assistant Attendant	110 00
David Montgomery, Assistant Attendant	110 00
H. Neumiller, Night Attendant	110 00
Bess Sloan, Night Attendant	110 00
Marie Spayd, Night Attendant	110 00
Pearl Stansell, Night Attendant	110 00
Jennie Thompson, Night Attendant	110 00
Mae Trissel, Night Attendant	110 00
W. H. St. Clair, Night Attendant	125 00
Isabelle Gigler, Night Attendant	120 00
Byrdie Ryley, Surgical Nurse	110 00
P. J. McGlynn, Assistant Laundryman	115 00
Minette Decker, Laundress	105 00
Louise Elpers, Laundress	105 00
Ivy Joy, Laundress	105 00
Eliz. Anderson, Laundress	105 00
Ella Wilson, Laundress	110 00
Ed Thompson, Basementman	105 00
Otto Grassman, First Baker	125 00
Joseph Peltier, Second Baker	120 00
J. W. Eubanks, Cook S. B. R.	105 00
Agnes Boyer, Seamstress	110 00
George Phillips, Tailor	115 00
C. Ruffoni, Dairyman	125 00
T. Rhea, Milker-Laborer	110 00
J. Kruzier, Milker-Laborer	110 00
C. Luthi, Milker-Laborer	110 00
V. LeRoy, Milker-Laborer	110 00
J. Minnotti, Milker-Laborer	110 00
John Moller, Milker-Laborer	110 00
A. Payan, Milk-Test	110 00
Albina Tratto, Milk-Test	110 00
F. D. Eastman, Foreman, Spencer Ranch	110 00
Geo. McKenzie, Foreman, Hog Ranch	125 00
Jas. Clark, Foreman, Coombs Ranch	110 00
J. Reavis, Farmhand	105 00
T. J. Wooden, Farmhand	105 00
M. Mayberry, Landscape Gardener	125 00
Jas. Ward, Orchardist	120 00
H. D. Barnes, Poultryman	120 00
John Rossi, Vegetable Gardener	115 00
D. Vassallo, Assistant Vegetable Gardener	110 00
J. N. Jensen, Chauffeur	110 00
Blanche Lawhead, Diet Cook	94 00
Walter Belding, Carman	85 00
Chas. G. Lillis, Sculleryman	95 00
Gertrude Hullett, Housekeeper	89 00
Gertrude Brandenburg, Assistant Housekeeper	85 00
J. A. Dawson, Laboratory Assistant	85 00
Mamie Bell, Telephone Operator	85 00
Belle Cuff, Telephone Operator	85 00
H. R. Anderson, Assistant Attendant	94 00
F. R. Anthony, Assistant Attendant	100 00
C. Browning, Assistant Attendant	100 00
B. Baird, Assistant Attendant	85 00
L. Brush, Assistant Attendant	85 00
E. B. Lewis, Assistant Attendant	100 00
A. Leonard, Assistant Attendant	100 00
F. B. Lawhead, Assistant Attendant	100 00
P. Perada, Assistant Attendant	100 00
J. Schmidt, Assistant Attendant	100 00
H. J. Sweeney, Assistant Attendant	85 00
F. W. Thoms, Assistant Attendant	100 00
H. O. Blake, Assistant Attendant	100 00
F. E. Warren, Assistant Attendant	100 00
Ida May Anthory, Assistant Attendant	100 00
Anna Boesch, Assistant Attendant	100 00
Mabel Cassady, Assistant Attendant	90 00
Ida Hughes, Assistant Attendant	94 00
Lenora Lane, Assistant Attendant	94 00
Sarah Noder, Assistant Attendant	94 00
W. T. Parott, Assistant Attendant	100 00
Mary Sampson, Assistant Attendant	90 00
Majorie Shriver, Assistant Attendant	90 00
Della Stover, Assistant Attendant	100 00
Alta Stiles, Assistant Attendant	100 00
Zula Sword, Assistant Attendant	100 00
Jean Thompson, Assistant Attendant	100 00
Mabel Young, Assistant Attendant	100 00

NAPA STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Position	Amount
Iva Fowler, Assistant Attendant.....	99 00
Pearl Hartwell, Night Attendant.....	99 00
Susie Allen, Waitress, M. A. D. R.....	90 00
Ursylene Moore, Waitress, F. A. D. R.....	100 00
T. Storme, Waiter.....	100 00
Sophia Hollen, Maid.....	85 00
Mildred Brandlin, Cook.....	90 00
Delia Cooney, Maid.....	85 00
Anna Christensen, Maid.....	85 00
M. Kearney, Maid.....	85 00
Lizzie Norman, Maid.....	85 00
J. Barracco, Farmhand.....	100 00
A. Canton, Farmhand.....	100 00
J. B. Grigsby, Farmhand.....	90 00
C. P. Pierce, Farmhand.....	100 00
L. T. Hayman, Treasurer.....	70 00
Louis A. Cribari, Interne.....	60 00
Thos. R. Haig, Interne.....	60 00
J. Sunderseth, Carman.....	50 00
Frank Cooke, File Clerk.....	45 00
Roger Sprague, Clinical Clerk.....	45 00
H. W. Noyes, Assistant Clerk.....	45 00
Harry Smith, Assistant Clerk (store).....	30 00
Nancy Worrell, Stenographic Clerk.....	45 00
Wm. Wolfe, Mail Clerk.....	25 00
J. Anthony, Milker-Laborer.....	40 00
Nick Miller, Milk-Test.....	50 00
Andrew Miller, Farmhand-Laborer.....	50 00

Total \$38,976 60

(Number of persons engaged for temporary or emergency employment during the fiscal year ending June 30, 1920.)

May A. Ahern, Stenographer on Inventory: August 29-30, 2 days; September 2-5, 4 days; September 8-13, 6 days—12 days at \$5.00.....	\$60 00
W. Leamaster, Stockman: September 24-30, 7 days at \$60.00.....	14 00
October 1-13, 13 days at \$60.00.....	25 10
A. Payon, Stockman: October 15-31, 17 days at \$60.00.....	32 90
November 1-21, 21 days at \$60.00.....	42 00

Total \$176 06

NORWALK STATE HOSPITAL.

Norwalk California.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	\$301.00 to \$350.00.	Monthly Salary	Maintenance
Dr. C. F. Applegate, Superintendent.....	\$333 33	\$70 00	
	\$251.00 to \$275.00.		
Dr. A. E. Sisson, First Assistant Physician.....	270 00	70 00	
	\$176.00 to \$200.00.		
Dr. Arthur E. Strong, Assistant Physician.....	195 00	70 00	
	\$151.00 to \$175.00.		
G. B. Alexander, Business Manager.....	175 00	70 00	
Dr. E. Blanch Ramer, Assistant Physician.....	170 00	35 00	
Dr. W. H. Worley, Assistant Physician.....	170 00	35 00	
	\$126.00 to \$150.00.		
L. E. McDonald, Secretary.....	150 00	70 00	
A. C. McHugh, Engineer.....	135 00	35 00	
	\$101.00 to \$125.00.		
Blanche Addison, Chief Cook.....	110 00	35 00	
W. G. Lyster, Carpenter.....	110 00	35 00	
L. E. Ware, Tractor Operator.....	110 00	35 00	
Ernest DeRush, Plasterer.....	110 00	35 00	
J. C. Pemberton, Supervisor.....	105 00	35 00	
Frances Casper, Matron.....	105 00	35 00	

NORWALK STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

\$76.00 to \$100.00.		
Name of Officer or Employee and Title	Monthly Salary	Maintenance
Wm. Park, Baker	100 00	35 00
Arthur Cox, Upholsterer	100 00	35 00
P. F. Zanders, Laundryman	100 00	35 00
John Dow, Landscape Gardener	100 00	35 00
O. S. Watson, Plumber	100 00	35 00
Stanley Routledge, Farm Foreman	100 00	35 00
Wm. E. Plains, Storekeeper	100 00	35 00
George Ladd, Assistant Engineer	95 00	35 00
Cora Coggins, Surgical Nurse	90 00	35 00
W. S. Whittaker, Assistant Supervisor and Music	90 00	35 00
Emil Wickman, Vegetable Gardener	90 00	35 00
J. D. Grant, Farmer	90 00	35 00
G. W. Henderson, Dairyman	90 00	35 00
Fred A. Swan, Assistant Baker and Music	90 00	35 00
A. M. Macdonald, Assistant Bookkeeper	85 00	35 00
Belva Underwood, Steno-Clerk	85 00	35 00
Mabell Z. Saltzman, Stenographer	85 00	35 00
Esther H. Berg, Stenographer	85 00	35 00
C. F. Burke, Night Supervisor	85 00	35 00
Ivy Cox, Assistant Matron	85 00	35 00
Sidney Scott, Truck Driver	85 00	35 00
Ernestine Richmond, Dietitian	85 00	35 00
H. G. McPike, Second Attendant and Head Orchestra	80 00	35 00
Jas. McKee, Second Attendant and Music	80 00	35 00
Oscar Vogel, Night Watch and Music	80 00	35 00

\$51.00 to \$75.00.		
Alice Mathis, Industrial Teacher	75 00	35 00
Emma V. Bornholt, Hydrotherapist	75 00	35 00
T. B. White, Hydrotherapist	75 00	35 00
Etta Dunn, Night Watch	75 00	35 00
Wm. F. Ramer, Night Watch	75 00	35 00
L. W. Huddle, Night Watch	75 00	35 00
Chas A. Tichenor, Night Watch	75 00	35 00
R. S. Rodarmel, Night Watch	75 00	35 00
Margaret B. Lundstrom, Night Watch	75 00	35 00
Anna Filter, Night Watch	75 00	35 00
Blanch Deck, Night Watch	75 00	35 00
Laura Lytle, Night Watch	75 00	35 00
Alta Price, Night Watch	75 00	35 00
Oral Spain, Night Watch	75 00	35 00
Luella Spain, Night Watch	75 00	35 00
Margaret Waller, Charge Attendant	75 00	35 00
E. Rogers, Charge Attendant	75 00	35 00
Corinne Ray, Charge Attendant	75 00	35 00
A. F. Mathis, Charge Attendant	75 00	35 00
Wm. Olmstead, Charge Attendant	75 00	35 00
C. Hall, Charge Attendant	75 00	35 00
Sarah A. Chamberlain, Charge Attendant	75 00	35 00
Edgar R. Chamberlain, Charge Attendant	75 00	35 00
Emil Broderson, Charge Attendant	75 00	35 00
Belle S. Boyd, Charge Attendant	75 00	35 00
Esther Guin, Charge Attendant	75 00	35 00
Elijah Waller, Second Attendant and Music	75 00	35 00
V. F. McKee, Second Attendant and Music	75 00	35 00
H. G. Lytle, Barber and Ward Relief	75 00	35 00
Carrie Burgener, Second Assistant Cook	75 00	35 00
Verna McCain, Third Assistant Cook	75 00	35 00
G. D. Guin, Fireman	75 00	35 00
Jos. Schandoney, Milker	75 00	35 00
Don Curtis, Farm Hand	75 00	35 00
W. P. Henderson, Farm Hand	75 00	35 00
Emma J. Zanders, Seamstress	75 00	35 00
F. W. Lockyear, Farm Hand	75 00	35 00
Florence C. Porter, Treasurer	70 00	
I. W. Morrison, Second Attendant	70 00	35 00
Alyce Moffett, Second Attendant	70 00	35 00
Elsie Watson, Second Attendant	70 00	35 00
Chris Russell, Second Attendant	70 00	35 00
Alta McKee, Second Attendant	70 00	35 00
Helen Pemberton, Second Attendant	70 00	35 00
Orla Morrison, Second Attendant	70 00	35 00
Mae McGinley, Second Attendant	70 00	35 00
R. F. Hardie, Second Attendant	70 00	35 00
Margaret Broderson, Second Attendant	70 00	35 00
Oren P. Gregory, Assistant Laundryman	70 00	35 00
J. H. Weaver, Second Attendant	65 00	35 00
Virginia Weaver, Second Attendant	65 00	35 00

NORWALK STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary	Maintenance
Jessie M. Morrison, Second Attendant.....	65 00	35 00
Laura Talley, Second Attendant.....	65 00	35 00
Mrs. H. J. McSorley, Second Attendant.....	65 00	35 00
Elizabeth Watkins, Second Attendant.....	65 00	35 00
Brisco C. Brown, Second Attendant.....	65 00	35 00
Jessie Kimmel, Second Attendant.....	65 00	35 00
Mary Frear, Second Attendant.....	65 00	35 00
Margaret H. Hamilton, Second Attendant.....	65 00	35 00
H. W. Hamilton, Second Attendant.....	65 00	35 00
Celia Hall, Second Attendant.....	65 00	35 00
Leona Gentry, Second Attendant.....	65 00	35 00
Chas. E. Mack, Second Attendant.....	65 00	35 00
W. F. Burgener, Farmhand.....	65 00	35 00
Mary B. York, Cook (for Medical Superintendent).....	65 00	35 00
Christina L. Grant, Assistant Cook (farm).....	65 00	35 00
Cora King, Telephone Operator.....	60 00	35 00
J. O. Dunn, Kitchen Helper.....	60 00	35 00
Otis M. Lytle, Assistant Laundryman.....	60 00	35 00
Orien White, Laundress.....	60 00	35 00
Vivian Swan, Waitress.....	55 00	35 00

\$50.00 or under.

A. M. Sprowl, Second Attendant.....	50 00	35 00
Douglas R. Todd, Second Attendant.....	50 00	35 00
Patrick J. Blake, Outside Help.....	50 00	35 00
Thos. J. Hildebrandt, Outside Help.....	50 00	35 00
Minnie D. Curtis, Waitress.....	50 00	35 00
Ethel Ware, Waitress.....	50 00	35 00
Florence Smith, Waitress.....	50 00	35 00
Ida Hilliard, Waitress.....	50 00	35 00
Blaine Phillips, Office Help (patient).....	10 00	
Jerome Phillips, Assistant Carpenter (patient).....	10 00	

C. F. Applegate, Medical Superintendent.

SONOMA STATE HOME.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Eldridge, California, February 8, 1921.

Name of Officer or Employee and Title	Monthly Salary	Maintenance	Total Monthly
Dr. F. O. Butler, Medical Superintendent.....			\$333 33
Dr. A. A. Thurlow, First Assistant Physician.....			270 00
Dr. Geo. Ordahl, Educational Director and Psychologist.....			250 00
Dr. Mildred E. Thoren, Second Assistant Physician.....			195 00
W. T. Sutfenfield, Business Manager.....			200 00
Dr. E. V. Emery, Third Assistant Physician.....			170 00
Cyrus Innes, Electrician and Engineer.....			160 00
W. J. Walsh, Steam Fitter and Assistant Engineer.....	\$120 00	\$35 00	155 00
J. J. Sassenrath, Secretary to Medical Superintendent.....			150 00
F. H. Edrington, Painter.....	110 00	27 00	137 00
L. H. Johnson, Carpenter-Trainer.....	110 00	27 00	137 00
D. S. Fridger, Farm Foreman.....	90 00	35 00	125 00
W. F. Pettis, Bookkeeper.....			125 00
F. H. Case, Foreman Carpenter.....			120 00
E. A. Ranker, Blacksmith.....	110 00	11 00	121 00
Elizabeth L. Wilson, Teacher.....	85 00	27 00	112 00
Jos. Lennon, Fireman.....	95 00	16 00	111 00
E. M. Churchill, Handyman.....	75 00	35 00	110 00
Agnes Dickenson, Matron.....			110 00
Geo. Wilbur, Supervisor.....			110 00
J. Anderson, Baker.....			110 00
E. N. Dixon, Chef.....			110 00
Byron Weaver, Carpenter.....			110 00
O. F. Jewett, Druggist.....			110 00
Ethel McKinnon, Superintendent of Nurses.....			110 00
W. W. Budworth, Cement Worker.....			110 00
Mary Fowler, Night Attendant.....	75 00	35 00	110 00
Jas. Flynn, Plumber.....			110 00
Mae Innes, Night Attendant.....	75 00	35 00	110 00
Wm. Craib, Assistant Attorney and Athletic Trainer.....	75 00	27 00	102 00
H. F. Bliven, Painter's Helper.....	75 00	27 00	102 00
Edna Pfaff, Night Attendant.....	75 00	27 00	102 00
Laura E. Hansohn, Dietitian.....			100 00
Roy Callahan, Laundryman.....			100 00

SONOMA STATE HOME—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary	Maintenance	Total Monthly
Herman Schieck, Farm Hand	65 00	35 00	100 00
R. Hicken, General Utilityman	65 00	35 00	100 00
Anna Pettis, Head Teacher			100 00
Catherine Hamilton, Assistant Attendant	70 00	27 00	97 00
Lida Small, Assistant Seamstress	70 00	27 00	97 00
Wilhelmina Newcomb, Assistant Attendant	70 00	27 00	97 00
Lorraine Wilbur, Surgical Nurse			95 00
Jos. Clifford, Dairyman			95 00
Jos. Loughlin, Fireman			95 00
Chas. Rourke, Fireman			95 00
Chas Rubie, Fireman			95 00
H. J. Leonard, Head Attendant	75 00	24 00	94 00
Beatrice Lantz, Parole Officer and Social Service Worker			90 00
Inez Ashley, Assistant Nurse			90 00
Mollie Bartell, Assistant Nurse			90 00
Manuel Scopesi, Vegetable Gardener			90 00
Abbie Waters, Steno-Clerk			90 00
A. B. Williams, Assistant Attendant	70 00	19 00	89 00
R. E. Hamlin, Head Attendant	75 00	11 00	86 00
W. J. Faulkner, Night Attendant	75 00	11 00	86 00
Wm. L. Gray, First Assistant Cook			85 00
S. P. Korn, Mattress Maker			85 00
Wilhelmina Blaska, Assistant Matron			85 00
Steve Malone, Nightwatchman and Night Supervisor			85 00
Laura Wickham, Assistant Supervisor			85 00
Margaret Folger, Assistant Nurse			85 00
Jennie Kratzer, Night Nurse			85 00
Jessie Davis, Teacher			85 00
Dorothy Dickenson, Teacher			85 00
Amy T. Cooke, Teacher			85 00
Elizabeth Leshner, Teacher			85 00
Louis Bartell, Landscape Gardener			85 00
R. V. Hunter, Assistant Dairyman			85 00
C. S. Gossin, Clerk to Business Manager			85 00
M. Soley, Storekeeper			85 00
J. F. McDonald, Head Attendant and Moving Picture Opr.	75 00	7 50	82 50
B. F. Harrison, Assistant Attendant	70 00	11 00	81 00
Margaret Grove, Assistant Nurse			80 00
Mabel Churchill, Clinical Stenographer			80 00
Eileen Cowan, Junior Clerk			80 00
S. V. Thompson, Assistant Clerk to Business Manager			80 00
James Bolton, Relief Cook			75 00
J. E. Greaver, Butcher			75 00
W. L. Simpson, Second Assistant Cook			75 00
Angeline Sherer, Seamstress			75 00
Nelle Collins, Night Nurse			75 00
Edw. Regusci, Milker			75 00
D. C. Petersen, Poultryman			75 00
A. G. Wiget, Farm Hand and Tractor Operator			75 00
A. G. Thoren, Auto Truck Driver			75 00
B. R. Leach, Chauffeur			75 00
J. L. Babcock, Night Attendant			75 00
Clara Baldwin, Head Attendant			75 00
May Benjamin, Head Attendant			75 00
Jos. Bryan, Head Attendant			75 00
Maebelle Buhl, Night Attendant			75 00
Charles Crowe, Night Attendant			75 00
Emily Crowe, Night Attendant			75 00
Mattie Engstrum, Head Attendant			75 00
Sarah Evans, Head Attendant			75 00
I. Ewing, Head Attendant			75 00
Kate Ewing, Head Attendant			75 00
Frances Gassaway, Night Attendant			75 00
Margaret Gray, Head Attendant			75 00
Alma Hamlin, Head Attendant			75 00
Bruce Hamilton, Night Attendant			75 00
Chas. Hopcroft, Night Attendant			75 00
Wm. E. Hawkes, Nightwatchman			75 00
Rhoda Hunter, Night Attendant			75 00
Clara Johnson, Night Attendant			75 00
E. S. King, Night Attendant			75 00
W. E. Landgrebe, Head Attendant			75 00
Grace Leach, Head Attendant			75 00
Geo. H. Le Roy, Night Attendant			75 00
Severina Magetti, Head Attendant			75 00
Elizabeth Maguill, Night Attendant			75 00
J. C. Morse, Head Attendant			75 00
Margaret Muerer, Night Attendant			75 00
T. J. Murray, Night Attendant			75 00
Maebelle Murray, Night Attendant			75 00

SONOMA STATE HOME—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Total Monthly
Ada McFarland, Night Attendant	75 00
Mary Parkinson, Head Attendant	75 00
S. L. Remy, Head Attendant	75 00
Esther Rubie, Head Attendant	75 00
Mattie Thomson, Head Attendant	75 00
Susie Wier, Head Attendant	75 00
Rudolph Woff, Night Attendant	75 00
Nora Wainwright, Night Attendant	75 00
F. A. Cromwell, Secretary and Treasurer of Board of Managers	70 00
R. E. Bohm, Assistant Attendant	70 00
Mary Browning, Assistant Attendant	70 00
Nelle Bryson, Assistant Attendant	70 00
D. H. Bryson, Assistant Attendant	70 00
Mae Burroughs, Assistant Attendant	70 00
A. E. Buchanan, Assistant Attendant	70 00
Edna Buchanan, Assistant Attendant	70 00
J. M. Christian, Assistant Attendant	70 00
Katherine Cobb, Assistant Attendant	70 00
Mary Galligan, Assistant Attendant	70 00
I. C. Gladden, Assistant Attendant	70 00
Emma J. Gladden, Assistant Attendant	70 00
Edith Gossin, Assistant Attendant	70 00
Ellen Greaver, Assistant Attendant	70 00
Robert Hall, Assistant Attendant	70 00
Louise Hofer, Assistant Attendant	70 00
Bertha Korn, Assistant Attendant	70 00
Emma Larson, Assistant Attendant	70 00
Jennie Martin, Assistant Attendant	70 00
Eli Mathews, Assistant Attendant	70 00
Ida Morse, Assistant Attendant	70 00
Ralph Mountford, Assistant Attendant	70 00
Cornelia Mountford, Assistant Attendant	70 00
Ruth McAfee, Assistant Attendant	70 00
Lillian McDonald, Assistant Attendant	70 00
Rose Remy, Assistant Attendant	70 00
Mary Rourke, Assistant Attendant	70 00
Stella Soley, Assistant Attendant	70 00
Delina Thomas, Assistant Attendant	70 00
Ada Tisdale, Assistant Attendant	70 00
M. M. Widerick, Assistant Attendant	70 00
D. Wier, Assistant Attendant	70 00
Eliz. K. White, Assistant Attendant	70 00
Maud Wilson, Assistant Attendant	70 00
Mary Wilson, Assistant Attendant	70 00
Nellie Sherwood, Cook, Maple Hall	65 00
J. J. White, Shoemaker	65 00
Harry Spencer, Assistant Landscape Gardener	65 00
Jos. Berryhill, Farm Hand	65 00
Nathan Smith, Farm Hand	65 00
O. C. Moore, Outside Messenger	65 00
Gertrude Bangle, Assistant Attendant	65 00
Retta Berryhill, Assistant Attendant	65 00
Dora Gray, Assistant Attendant	65 00
Carrie Rawson, Assistant Attendant	65 00
Mary Prout, Cook, Superintendent's Cottage	60 00
Aloise Stimmer, Cook, Manor House	60 00
Mable Sassenrath, Telephone Operator and Librarian	60 00
Gladys Collins, Assistant Cook, Maple Hall	55 00
Effe Callahan, Assistant Laundress	55 00
Minda Ranker, Laundry Distributor	55 00
Henry Dixon, Assistant Attendant	55 00
Estelle Weaver, Assistant Attendant	55 00
Bernice Chance, Dishwasher	50 00
Frances E. Faulkner, Waitress	50 00
Carrie Francisco, Waitress	50 00
Maud Mathews, Waitress	50 00
F. Tillmannshoffer, Waitress	50 00
Irena Herrington, Assistant Attendant	50 00
W. H. Howe, Assistant Attendant	50 00
F. B. Marshall, Assistant Attendant	50 00
Pietro Virdolino, Assistant Attendant	50 00
A. Hunter, Cook at Dairy	45 00
W. Rollins, Assistant Landscape Gardener	35 00
G. W. Callahan, Caretaker of Stock	25 00
Archie Sealight, With Farm Hands (inmate)	25 00
Howard Salisbury, Assistant Vegetable Gardener (inmate)	20 00
Pay Udell, Assistant to Baker (inmate)	10 00
Leon Richards, With Farm Hands (inmate)	10 00

SONOMA STATE HOME—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Temporary Positions.

Name of Officer or Employee and Title	Daily Wage
Michael Slattery, Pruner-----	\$3 00

Temporary Positions Filled During Fiscal Year Ending June 30, 1920.

John Douglas, Pruner, Amount paid during fiscal year-----	\$476 00
C. Garrison, Pruner, Amount paid during fiscal year-----	110 00
H. Gardiner, Bricklayer, Amount paid during fiscal year-----	347 00
T. H. Wilson, Bricklayer's Helper, Amount paid during fiscal year-----	262 50
David Hatton, Laborer, Amount paid during fiscal year-----	104 00

SOUTHERN CALIFORNIA STATE HOSPITAL.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
John A. Reily, Medical Superintendent-----	\$333 33
Edwin Wayte, First Assistant Physician-----	270 00
G. M. Webster, Assistant Physician-----	225 00
S. B. Pond, Assistant Physician-----	210 00
H. S. Blossom, Assistant Physician-----	210 00
J. C. Cram, Business Manager-----	200 00
E. W. Meyer, Assistant Physician-----	195 00
Pearl S. Waters, Assistant Physician-----	195 00
F. F. Williams, Assistant Physician-----	195 00
Mary Beall, Assistant Physician-----	195 00
Carl Dyna, Druggist and Pathologist-----	175 00
Ernest Thompson, Dentist-----	175 00
Ida K. Moisan, Secretary-----	175 00
E. L. Patterson, Engineer-----	145 00
J. T. Wells, Cook-----	130 00
Ralph Motherspaw, Head Farmer-----	120 00
L. L. Nichols, Assistant Engineer and Plumber-----	120 00
Harry Root, Assistant Engineer and Plumber-----	120 00
A. J. Doan, Painter-----	120 00
Harry Welton, Carpenter-----	120 00
D. M. Barker, Mason-----	120 00
Ira Eskew, Plumber-----	120 00
L. A. Moisan, Supervisor-----	115 00
Katherine McKellar, Matron-----	115 00
Juanita Mertz, Bookkeeper-----	110 00
E. G. Reynolds, Dairyman-----	110 00
Fred Heath, Laundryman-----	110 00
D. S. Rickert, Baker-----	110 00
Frank Rupp, Shoemaker-----	110 00
Harry E. Smith, Storekeeper-----	105 00
Margaret Doyle, Dietitian-----	100 00
J. A. Teagle, Industrial Man-----	100 00
C. L. Brinker, Fireman-----	95 00
George Munsch, Assistant Baker and Musician-----	95 00
Victor Seeley, First Assistant Cook-----	95 00
R. M. Bromilow, Assistant Supervisor-----	90 00
T. B. Sharp, Night Assistant Supervisor-----	90 00
Harriet Burkhardt, Assistant Matron-----	90 00
Ella Stevens, Assistant Matron, Night-----	90 00
E. C. Worley, Assistant Matron, R. C.-----	90 00
F. L. Ball, Hostler and Pigman-----	90 00
S. Simonsen, Land and Vegetable Gardener-----	90 00
Lenore Rupp, Assistant Cook-----	85 00
Ed Keating, Industrial Department-----	85 00
E. A. Boggs, Physical Director-----	85 00
Elsie Fyle, Arithmetic Class Teacher-----	85 00
Jessie Whalen, Industrial Teacher-----	85 00
G. L. Hyatt, Assistant Dairyman-----	85 00
Marjorie Palmer, Stenographer-----	85 00
H. B. Montgomery, Stenographer-----	85 00
Charles Case, Truck Driver-----	85 00
Villa Kenison, Stenographer, Clinical-----	80 00
Blenn Graham, Night Attendant and Musician-----	80 00
Charles Dunn, Assistant Attendant and Embalmer-----	80 00
E. M. Halcom, Butcher-----	75 00
Ethel Ridpath, Staff Cook-----	75 00
W. J. Ashley, Assistant Cook-----	75 00
Winnie Houston, Night Cook-----	75 00
Bessie Dickins, Seamstress-----	75 00
J. M. Westmoreland, Assistant Laundryman-----	75 00

SOUTHERN CALIFORNIA STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
W. T. Admire, Attendant	75 00
Golda Brinker, Attendant	75 00
J. B. Gatlin, Night Attendant	75 00
Alice Case, Attendant	75 00
J. A. Clark, Attendant	75 00
W. D. English, Night Attendant	75 00
C. B. Collins, Night Attendant	75 00
Alice Courtright, Attendant	75 00
Elmer Kinder, Night Attendant	75 00
Herman Estes, Attendant	75 00
J. H. Garman, Night Attendant	75 00
J. G. Goforth, Attendant	75 00
Frank Folrath, Night Attendant	75 00
T. R. Hartle, Attendant	75 00
C. C. Hess, Attendant	75 00
Lena Hess, Attendant	75 00
William A. Hunt, Attendant	75 00
Allan J. Kester, Night Attendant	75 00
W. D. May, Night Attendant	75 00
W. L. Maxwell, Night Attendant	75 00
John R. Martin, Night Attendant	75 00
J. W. Moore, Attendant	75 00
Clarence McIlree, Night Attendant	75 00
J. N. Richards, Night Attendant	75 00
William Ridpath, Attendant	75 00
W. W. Parks, Night Attendant	75 00
J. N. Clepper, Night Attendant	75 00
Bert Fyle, Night Attendant	75 00
Oda McIlree, Night Attendant	75 00
W. M. Perkins, Night Attendant	75 00
O. D. Puckett, Night Attendant	75 00
Ed Weeden, Night Attendant	75 00
J. F. Smith, Night Attendant	75 00
Charles F. Watson, Attendant	75 00
Marion Teagle, Attendant	75 00
F. J. Webster, Night Attendant	75 00
Bessie Wilson, Night Attendant	75 00
Amy Wixon, Attendant	75 00
J. B. Womack, Night Attendant	75 00
Mary Womack, Night Attendant	75 00
Agnes Admire, Attendant	75 00
Georgia Benson, Attendant	75 00
Benson Collins, Night Attendant	75 00
Lillian Dorman, Attendant	75 00
Kate English, Night Attendant	75 00
Estelle Garman, Night Attendant	75 00
Agnes Garvin, Night Attendant	75 00
Margaret Graham, Night Attendant	75 00
Prudy May, Night Attendant	75 00
Martha Kester, Night Attendant	75 00
Irene Lodgaard, Night Attendant	75 00
Kern Martin, Night Attendant	75 00
Ella Munsch, Attendant	75 00
Myrtle McIlree, Night Attendant	75 00
Ida Scofield, Night Attendant	75 00
Mabel Clepper, Night Attendant	75 00
Agnes Richards, Night Attendant	75 00
Mary E. Parks, Night Attendant	75 00
Ezel Shoemaker, Night Attendant	75 00
Mamie Puckett, Night Attendant	75 00
Mary Smith, Night Attendant	75 00
Minnie Smith, Attendant	75 00
Juanita Tanner, Attendant	75 00
Elizabeth Wade, Attendant	75 00
Lizzie Williamson, Attendant	75 00
Lillie Wise, Night Attendant	75 00
Edna McIlree, Night Attendant	75 00
Olive Fayhs, Assistant Attendant and Musician	75 00
Callie Hatcher, Night Attendant	75 00
Ella Fairbairn, Head Nurse	75 00
Anna Handley, Head Nurse	75 00
Kizzie Graham, Night Attendant	75 00
J. K. Wilson, Night Attendant	75 00
Fred Farr, Male Nurse	75 00
Mary Dwyer, Attendant	75 00
Emma Coy, Night Attendant	75 00
Suzanne Talbert, Attendant	75 00
L. F. Courtright, Farm Hand	75 00
J. F. Reedy, Blacksmith	75 00
N. J. Gann, Farm Hand	75 00

SOUTHERN CALIFORNIA STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
L. C. Blomfield, Farm Hand.....	75 00
Lon Matthes, Farm Hand.....	75 00
M. L. Speake, Farm Hand.....	75 00
G. Metzger, Farm Hand.....	75 00
E. G. McClure, Farm Hand.....	75 00
Chas. Rausch, Farm Hand.....	75 00
J. J. Pierce, Farm Hand.....	75 00
H. F. Kinney, Farm Hand.....	75 00
Rose Hiner, Telephone Operator.....	75 00
Mrs. D. M. Barker, Assistant Seamstress.....	70 00
Lila Motherspaw, Laundry help.....	70 00
Mrs. Fred Heath, Laundry help.....	70 00
R. Siler, Laundry help.....	70 00
Chas. Wixon, Laundry help.....	70 00
Mrs. J. N. Westmoreland, Laundry help.....	70 00
Wattie Metzger, Laundry help.....	70 00
J. B. Alwran, Assistant Attendant.....	70 00
E. J. Babin, Assistant Attendant.....	70 00
Thos. Campbell, Assistant Attendant.....	70 00
C. W. Boner, Assistant Attendant.....	70 00
H. C. Bonham, Assistant Attendant.....	70 00
E. C. Dorman, Assistant Attendant.....	70 00
W. L. Dixon, Assistant Attendant.....	70 00
J. D. Dunignan, Assistant Attendant.....	70 00
Anna Dunn, Assistant Attendant.....	70 00
Clara Eskew, Assistant Attendant.....	70 00
P. R. Fairbairn, Assistant Attendant.....	70 00
Jno. Gourley, Assistant Attendant.....	70 00
Amanda Greenwood, Assistant Attendant.....	70 00
C. B. Greenwood, Assistant Attendant.....	70 00
R. A. Harter, Assistant Attendant.....	70 00
Kate Hartle, Assistant Attendant.....	70 00
G. F. Hiner, Assistant Attendant.....	70 00
A. J. Hopkins, Assistant Attendant.....	70 00
J. D. Houze, Assistant Attendant.....	70 00
Eugenie Houze, Assistant Attendant.....	70 00
Eva Hyatt, Assistant Attendant.....	70 00
Ora E. Johnson, Assistant Attendant.....	70 00
John Lowe, Assistant Attendant.....	70 00
Bruce Luncford, Assistant Attendant.....	70 00
J. E. Matthews, Assistant Attendant.....	70 00
F. J. Martin, Assistant Attendant.....	70 00
Ollie McClure, Assistant Attendant.....	70 00
Chas. Oxford, Assistant Attendant.....	70 00
F. E. Nason, Assistant Attendant.....	70 00
Martin Phillips, Assistant Attendant.....	70 00
T. J. Pullman, Assistant Attendant.....	70 00
F. A. Krause, Assistant Attendant.....	70 00
Chas. Ritchie, Assistant Attendant.....	70 00
Frank Ruch, Assistant Attendant.....	70 00
A. A. Scott, Assistant Attendant.....	70 00
Olive Sharpe, Assistant Attendant.....	70 00
Josephine Speake, Assistant Attendant.....	70 00
E. G. Ramsey, Assistant Attendant.....	70 00
Richard Stewart, Assistant Attendant.....	70 00
Thos. Tanner, Assistant Attendant.....	70 00
Geo. Stephenson, Assistant Attendant.....	70 00
M. L. Uptain, Assistant Attendant.....	70 00
J. M. Vancil, Assistant Attendant.....	70 00
Frank Vessels, Assistant Attendant.....	70 00
E. B. Wade, Assistant Attendant.....	70 00
E. B. Williamson, Assistant Attendant.....	70 00
Geo. B. Fayhe, Assistant Attendant.....	70 00
Lona Barth, Assistant Attendant.....	70 00
Ellie Clark, Assistant Attendant.....	70 00
Irene Boggs, Assistant Attendant.....	70 00
Ella Dixon, Assistant Attendant.....	70 00
Alice Dunevant, Assistant Attendant.....	70 00
Maude Dunigan, Assistant Attendant.....	70 00
Alice Estes, Assistant Attendant.....	70 00
Mary H. Ritchie, Assistant Attendant.....	70 00
Robena Hagey, Assistant Attendant.....	70 00
Mae Hopkins, Assistant Attendant.....	70 00
Anna Keating, Assistant Attendant.....	70 00
Edna Lowe, Assistant Attendant.....	70 00
Venna Mathews, Assistant Attendant.....	70 00
Dora Martin, Assistant Attendant.....	70 00
Eunice Oxford, Assistant Attendant.....	70 00
Lillie Phillips, Assistant Attendant.....	70 00
Myrtle Rausch, Assistant Attendant.....	70 00

SOUTHERN CALIFORNIA STATE HOSPITAL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Olla Ruch, Assistant Attendant.....	70 00
Elizabeth Sinnott, Assistant Attendant.....	70 00
Era Uptain, Assistant Attendant.....	70 00
Margaret Zimmerman, Assistant Attendant.....	70 00
Mabel Ramsey, Assistant Attendant.....	70 00
Nellie Scott, Assistant Attendant.....	70 00
Mary D. Smith, Assistant Attendant.....	70 00
May Williford, Assistant Attendant.....	70 00
Mabel Blomfield, Assistant Attendant.....	70 00
Esther Harter, Assistant Attendant.....	70 00
Minnie Stewart, Assistant Attendant.....	70 00
Dimple Hunt, Assistant Attendant.....	70 00
J. A. Guthrie, Assistant Attendant*.....	70 00
Esther Nichols, Superintendent's Cook.....	65 00
Jas. Emerson, Assistant Attendant.....	65 00
Allen Bowling, Assistant Attendant.....	65 00
J. D. Behrens, Assistant Attendant.....	65 00
Chilton Scott, Assistant Attendant.....	65 00
E. M. Roberts, Assistant Attendant.....	65 00
Chas. M. Gilmore, Assistant Attendant.....	65 00
Z. A. Heischman, Assistant Attendant.....	65 00
J. C. Holt, Assistant Attendant.....	65 00
Ross Huddle, Assistant Attendant.....	65 00
Inis E. Jameson, Assistant Attendant.....	65 00
F. Houston, Assistant Attendant.....	65 00
J. H. Burt, Assistant Attendant.....	65 00
Sid Stephens, Assistant Attendant.....	65 00
A. Van Sermand, Assistant Attendant.....	65 00
J. F. Cummings, Assistant Attendant.....	65 00
Chester Sims, Assistant Attendant.....	65 00
H. F. Williamson, Assistant Attendant.....	65 00
Jennie Ashley, Assistant Attendant.....	65 00
Laura Heischman, Assistant Attendant.....	65 00
Elizabeth Behrens, Assistant Attendant.....	65 00
Harriet Gamble, Assistant Attendant.....	65 00
Stella Roberts, Assistant Attendant.....	65 00
Myrtle Scott, Assistant Attendant.....	65 00
Carrie Jameson, Assistant Attendant.....	65 00
Mrs. D. C. Loomis, Assistant Attendant.....	65 00
Winnie Gilmore, Assistant Attendant.....	65 00
Hortence Burt, Assistant Attendant.....	65 00
Emma Williamson, Assistant Attendant.....	65 00
Mary Wilson, Assistant Attendant.....	65 00
Susie Watson, Assistant Attendant.....	65 00
Bernard Paget, Assistant Attendant.....	65 00
Lillie Huddle, Assistant Attendant.....	65 00
Evie Van Sermand, Assistant Attendant.....	65 00
A. E. DuBois, Assistant Attendant.....	65 00
Catherine Lathrow, Assistant Attendant.....	65 00
Lenora Breitoiser, Assistant Attendant.....	65 00
Mary Moran, Assistant Attendant.....	65 00
Carl Hammer, Usher.....	65 00
Harry Seigel, Basement Man.....	60 00
Grace Vessels, Waitress.....	60 00
T. E. Glosser, Tailor.....	60 00
Thos. Bigford, Assistant Attendant.....	60 00
Walter Letteau, Assistant Attendant.....	60 00
Margaret Bowling, Assistant Attendant.....	60 00
Ruth Gamble, Assistant Attendant.....	60 00
Anna Dodge, Assistant Attendant.....	60 00
Mary Rule, Assistant Attendant.....	60 00
Carmen Dodge, Assistant Attendant.....	60 00
J. E. Holt, Assistant Attendant.....	60 00
Pauline Reedy, Waitress.....	55 00
M. Hope, Assistant Attendant.....	55 00
Amy Davis, Assistant Attendant.....	55 00
Grace Kaufman, Assistant Attendant.....	55 00
Leila Tompkins, First Assistant's Maid.....	50 00
Geo. Webb, Assistant Attendant.....	50 00
T. J. Lathrow, Assistant Attendant.....	50 00
Grace Gallup, Assistant Attendant.....	50 00
Mary Hope, Assistant Attendant.....	50 00
Vera Holt, Assistant Attendant.....	50 00
Pearl Box, Assistant Attendant.....	50 00
Katherine C. Miller, Assistant Attendant.....	10 00
H. E. Smith, Band Leader.....	5 00
L. L. Nichols, Musician.....	5 00
D. M. Barker, Musician.....	5 00
J. A. Teagle, Musician.....	5 00

SOUTHERN CALIFORNIA STATE HOSPITAL—Continued.

(Report of officers and regular employees receiving cash in lieu of maintenance.)

Name of Officer or Employee and Title	Amount Received
Carl Dyna, Druggist and Pathologist	27 00
H. E. Smith, Storekeeper	27 00
Marjorie Palmer, Stenographer	19 00
Agnes Admire, Attendant	11 00
J. W. Moore, Attendant	11 00
Robena Hagey, Assistant Attendant	11 00
Thos. Campbell, Assistant Attendant	11 00
C. W. Boner, Assistant Attendant	11 00
Josephine Speake, Assistant Attendant	11 00
A. A. Scott, Assistant Attendant	11 00
M. L. Uptain, Assistant Attendant	11 00
Anna Keating, Assistant Attendant	11 00
Grace Vessels, Assistant Attendant	11 00
C. P. Collins, Night Attendant	11 00
W. L. Maxwell, Night Attendant	11 00
D. M. Barker, Mason	11 00
J. F. Reedy, Blacksmith	11 00
Harry Root, Engineer and Plumber	11 00
Fred Heath, Laundryman	11 00
Wattie Metzger, Laundry help	11 00
A. J. Doane, Painter	11 00
D. S. Rickert, Baker	11 00
J. T. Wells, Cook	11 00
R. M. Bromilow, Assistant Supervisor	11 00
Margaret Zimmerman, Assistant Attendant	11 00
W. A. Hunt, Attendant	11 00
Geo. Stephenson, Assistant Attendant	11 00
J. G. Goforth, Attendant	11 00
Rose Hiner, Telephone Operator	11 00

STOCKTON STATE HOSPITAL.

Stockton, California, January 1, 1921.

Name and Title	Monthly Salary
Fred P. Clark, Medical Superintendent	\$333 33
\$251.00 to \$275.00	
W. H. Chesnutwood, Business Manager	275 00
Margaret H. Smyth, First Assistant Physician	270 00
From \$201.00 to \$225.00.	
H. E. Sanderson, Second Assistant Physician	225 00
A. H. McLeish, Assistant Physician	225 00
S. P. Tuggle, Assistant Physician	225 00
F. S. Marnell, Assistant Physician	225 00
F. J. Conzelmann, Clinical Director	225 00
N. E. Williamson, Pathologist	225 00
M. La Place, Dentist	210 00
From \$176.00 to \$200.00.	
Grace McCloskey, Assistant Physician	195 00
Geo. H. Buttrick, Engineer Female Department	185 00
J. R. Fitchie, Builder and Electrician	185 00
M. Foley, Dairyman	180 00
From \$151.00 to \$175.00.	
Geo. A. Brown, Jr., Secretary	175 00
George Knudson, Chief Cook, Female Department	175 00
Louis Silvani, Chief Cook, Male Department	175 00
J. J. Kennedy, Carpenter and Moving Picture Operator	165 00
J. J. Camley, Foreman Painter	165 00
R. F. O'Rourke, Foreman Plumber	165 00
C. C. Castle, Farm Foreman	165 00
E. D. Pillsbury, Bookkeeper	160 00
B. L. Mason, General Mechanic and Crematory Operator	160 00
Edw. P. Higby, Apothecary	160 00
Louise E. Higuera, Typist and Office Assistant and Member Orchestra	155 00
L. G. Foster, Assistant Engineer and Refrigeration	155 00
Hugh McCabe, Chief Baker	155 00
H. W. Puffer, Shoemaker	155 00
George Brownfield, General Mechanic	155 00
D. A. McCormick, Upholsterer	155 00
H. S. Goggins, Laundryman	155 00
F. E. Hoge, Carpenter	155 00
J. H. Farrell, Assistant Painter	155 00
W. Markham, Plasterer	155 00
Albert Fedler, Tinsmith	155 00
D. C. Kent, Assistant Plumber	155 00
Robert Henry, Blacksmith	155 00
C. Jacinto, Tractor Operator	155 00
L. Shepherd, Storekeeper	155 00

STOCKTON STATE HOSPITAL—Continued.

From \$126.00 to \$150.00.

Name and Title	Monthly Salary
James A. Smith, Stationary Engineer	150 00
Mabel L. Hersom, Head Nurse, Receiving Building	150 00
Miss J. A. Giannini, Matron Female Department	150 00
G. T. Austin, Supervisor Male Department	150 00
E. J. Krost, Truck Driver	145 00
G. E. Green, Stationary Engineer, Female Department	140 00
D. W. Conway, First Assistant Cook, Female Department	140 00
R. W. Dean, First Assistant Cook, Male Department	140 00
J. Keenon, First Cook, Convalescent Cottage	140 00
C. O. Nelson, Substitute Cook	140 00
Gertrude Pepper, Stenographer for Superintendent and Assistant Physician	135 00
J. C. Gassaway, Stationary Engineer, Male Department	135 00
V. C. Jones, Stationary Engineer, Female Department	135 00
Jacoba Slobe, Medical Dietitian	135 00
J. F. Koegler, Landscape Gardener	135 00
Felix Desmond, Farm Foreman, Sherman Island	135 00
John Risso, Vegetable Gardener	135 00
W. H. Zuver, Stationary Engineer	135 00
L. A. Burns, Teacher	130 00
Miss J. M. Fluty, Teacher	130 00
George Eybs, Second Assistant Cook, Female Department	130 00
Mrs. E. Hauselt, Chief Cook, Receiving Building	130 00
C. E. Morrissey, Second Assistant Cook, Male Department	130 00
James McDonald, Cook, Sherman Island	130 00
John Hughes, First Assistant Baker	130 00
Mary Sapp, Surgical Nurse	130 00

From \$101.00 to \$125.00.

Cecil Johnson, Assistant Supervisor	125 00
G. G. Curtis, Night Supervisor	125 00
George B. Head, Assistant Storekeeper	125 00
Mrs. Mary McIntire, Night Supervisor	125 00
May E. Shaw, Assistant Matron	125 00
L. E. Carlson, Hydro and Masseur	125 00
Julia Connolly, Hydro and Masseur	125 00
Geo. O. Pritchett, Milker	125 00
Charles Stewart, Milker	125 00
J. H. Taylor, Milker	125 00
Wm. Desmond, Watchman, Sherman Island	125 00
H. H. Baxter, Poultryman	125 00
Myrtle Blazer, Stenographer and Assistant Bookkeeper	120 00
S. Bjornson, Second Assistant Supervisor	120 00
Mrs. W. A. Fisher, Assistant Teacher	120 00
Frank Baumhagger, Butcher	120 00
J. M. Bennett, Assistant Cook, Convalescent Cottage	120 00
Mary Cox, Assistant Cook, Receiving Building	120 00
J. P. Doughty, Third Assistant Cook, Male Department	120 00
Frances Dupsyk, Cook, Cottage One	120 00
James Patterson, Third Cook, Male Department	120 00
Mrs. Margaret Crowley, Second Assistant Matron	120 00
J. M. Christensen, Second Assistant Baker	120 00
W. R. Bruce, Assistant Laundryman and Member Orchestra	120 00
H. C. Fox, General Mechanic	120 00
Daniel Mackenzie, General Mechanic	120 00
Mrs. S. F. Dore, Head Nurse, Cottage 1	115 00
Mrs. J. F. Bush, Head Nurse, Cottage 2	115 00
Mrs. E. J. Petri, Head Nurse, Cottage A	115 00
Thirza McLean, Head Nurse, Convalescent Cottage	115 00
Mrs. Roy MacDonald, Medical Stenographer	115 00
Frank P. Shaver, Laboratory Assistant	115 00
John Schone, Assistant Gardener	115 00
Edward Weishach, Farm Hand	115 00
John Stevano, Assistant Gardener	115 00
G. A. Tanascia, Assistant Gardener	115 00
Gladys Swartz, Stenographer	110 00
A. Curry, Chauffeur	110 00
Charles Beatty, Attendant, Receiving Building	110 00
M. B. Curtis, Night Attendant, Receiving Building	110 00
Mrs. Mary Holden, Night Attendant, Receiving Building	110 00
Mrs. Mary Pyle, Night Attendant, Receiving Building	110 00
Mrs. Linda Loveridge, Night Attendant, Receiving Building	110 00
Mrs. E. Roush, Attendant, Receiving Building	110 00
Charles Ainsley, Attendant, Male Department	110 00
Frank Barger, Attendant, Male Department	110 00
J. M. Banard, Attendant, Male Department	110 00
Hillis Brown, Attendant, Male Department	110 00
Mrs. Allie Brown, Tailoress	110 00
Charles Bryan, Night Attendant	110 00
F. H. Burns, Attendant	110 00
T. W. Cliberon, Attendant	110 00
L. J. Cottrell, Attendant	110 00
Edgar Cox, Night Attendant	110 00
Zulu Green, Attendant	110 00

STOCKTON STATE HOSPITAL—Continued.

Name and Title	Monthly Salary
Minnie Hible, Night Attendant	110 00
Miss M. Hopkins, Attendant	110 00
Mabel James, Night Attendant	110 00
Mrs. E. Krosta, Attendant	110 00
Ada Ida Shum, Attendant	110 00
Mrs. M. Lewis, Attendant	110 00
Sallie Lovelace, Attendant	110 00
Mrs. R. P. Logan, Attendant	110 00
Mrs. G. B. McPherson, Night Attendant	110 00
Gertrude Osborn, Attendant	110 00
Miss L. O'Hara, Attendant	110 00
Mrs. M. Penninger, Night Attendant	110 00
Mrs. A. E. Powell, Attendant	110 00
Mrs. Eliz Regan, Night Attendant	110 00
Miss C. E. Rehm, Attendant	110 00
Sallie Rhodes, Attendant	110 00
May Roberts, Attendant	110 00
Belle Shirley, Attendant	110 00
Florence Sinks, Attendant	110 00
Sarah Smith, Attendant	110 00
Mrs. A. G. Towne, Night Attendant	110 00
Alma Van Pelt, Attendant	110 00
Mrs. I. Brown, Trained Nurse	110 00
P. T. Dermody, Night Attendant	110 00
Percy Browning, Night Attendant	110 00
Irhoda Musser, Night Attendant	110 00
Barth Buol, Night Attendant	110 00
W. P. Thornton, Attendant	110 00
Ruth Pepper, Stenographer and Filing Clerk	110 00
Ruth Olson, Stenographer and Clinical Clerk	110 00
Millie Sartori, Assistant Waitress, Female Department	110 00
Mrs. A. Housh, Seamstress	110 00
Mrs. E. Hathaway, Laundress	110 00
L. W. Arnold, Farmhand	110 00
Henry Barker, Farmhand	110 00
E. H. Danielson, Farmhand	110 00
W. R. Bissett, Farmhand	110 00
John Fox, Farmhand	110 00
E. E. Johnson, Farmhand	110 00
J. O. Leonard, Farmhand	110 00
C. L. McReynolds, Farmhand	110 00
Moses Pritchard, Farmhand, Sherman Island	110 00
J. Robinson, Farmhand, Sherman Island	110 00
R. C. Scott, Farmhand, Sherman Island	110 00
A. N. White, Farmhand, Sherman Island	110 00
G. H. White, Farmhand, Sherman Island	110 00
T. M. McCarty, Farmhand, Sherman Island	110 00
W. E. Whipple, Hostler	110 00
D. G. Sherwood, Night Attendant	110 00
Clay Crane, Attendant	110 00
A. Cunningham, Night Attendant	110 00
Michael Curtin, Attendant	110 00
G. E. Curtis, Night Watchman	110 00
G. H. Derrick, Attendant	110 00
John D. Fitch, Attendant	110 00
W. J. Hanlon, Night Attendant	110 00
W. S. Hall, Assistant and Member Orchestra	110 00
A. R. Hall, Attendant and Usher	110 00
Frank Harper, Attendant	110 00
Orla Hille, Attendant	110 00
A. G. Hooker, Attendant	110 00
J. W. Johnes, Attendant	110 00
Guy Keeton, Attendant	110 00
Peter Martin, Night Attendant	110 00
J. B. Meyers, Attendant	110 00
R. F. Mooty, Night Attendant	110 00
Joseph Murtha, Attendant	110 00
W. O'Connell, Attendant	110 00
E. Z. Palin, Assistant and Member Orchestra	110 00
E. Petri, Attendant	110 00
O. P. Ray, Attendant	110 00
W. T. Ragsdale, Attendant	110 00
F. J. Regan, Night Attendant	110 00
J. W. Rodgers, Attendant	110 00
J. H. Sparks, Night Attendant	110 00
C. W. Streib, Assistant and Member Orchestra	110 00
C. W. Sutherland, Night Attendant	110 00
W. A. Webb, Night Attendant	110 00
Emily Anderson, Attendant	110 00
W. G. Anderson, Night Watchman	110 00
Anna Armstrong, Night Watchman	110 00
Mrs. A. Bjornson, Attendant	110 00
Minnie Brawner, Night Attendant	110 00

STOCKTON STATE HOSPITAL—Continued.

Name and Title	Monthly Salary
Miss F. Burton, Night Attendant	110 00
Mrs. G. Buttrick, Attendant	110 00
Mrs. M. Cooper, Attendant	110 00
Mrs. E. Dinwiddie, Attendant	110 00
Mrs. L. Doir, Night Attendant	110 00
Mrs. K. Mills, Attendant	110 00
R. H. Evans, Assistant	105 00
T. F. Foster, Assistant	105 00
O. H. Goodwin, Assistant	105 00
Harvey Harrison, Assistant	105 00
J. H. Kerns, Assistant	105 00
Wm. Lewis, Assistant	105 00
C. Owens, Assistant	105 00
W. J. Rigney, Assistant	105 00
R. L. Thompson, Assistant	105 00
F. Trulsson, Assistant	105 00
J. Vaughan, Assistant	105 00
Ike B. Watson, Assistant	105 00
Bert Wininger, Assistant	105 00
Mrs. H. Aldridge, Assistant	105 00
Mrs. Bessie Bartlett, Assistant	105 00
Mrs. H. Bryan, Assistant	105 00
Mamie Donahue, Assistant	105 00
Mary Gaynor, Assistant	105 00
Edna Gossage, Assistant	105 00
Ruby Carlton, Assistant	105 00
Charlotte Dean, Assistant	105 00
Stella Emerson, Assistant	105 00
O. R. Hines, Assistant	105 00
W. B. Ammerman, Assistant	105 00
Ben Barger, Assistant	105 00
W. H. Bettinger, Assistant	105 00
Frank Bush, Assistant	105 00
S. H. Byas, Assistant	105 00
F. G. Connor, Assistant	105 00
Hazel Hilsmeier, Assistant	105 00
Mrs. H. Montgomery, Assistant	105 00
Mrs. B. Mulvaney, Assistant	105 00
Miss E. McVicker, Assistant	105 00
Iva Perry, Assistant	105 00
Lena Stanford, Assistant	105 00
Mary Wingate, Assistant	105 00
Charles Brown, Assistant	105 00
Mrs. E. Hildreth, Attendant Nurse	105 00
W. J. Hildreth, Attendant Nurse	105 00
O. L. Bush, Attendant Nurse	105 00
Mrs. Q. Ray, Attendant Nurse	105 00
Mrs. S. L. Beilby, Attendant Nurse	105 00
R. W. Dulin, Attendant Nurse	105 00
Nellie Garvin, Assistant Seamstress	105 00
Mrs. C. W. Coffelt, Laundry Help	105 00
Alice McCarty, Assistant Laundry Help	105 00
\$76.00 to \$100.00	
Maud Sollars, Telephone Operator	100 00
Cora Ambrose, Assistant Attendant	100 00
George Erwin, Assistant Attendant	100 00
Fannie Harbison, Assistant Attendant	100 00
Joseph Brennan, Assistant Attendant	100 00
W. G. Cook, Assistant Attendant	100 00
L. T. Connell, Assistant Attendant	100 00
Joseph Demeret, Assistant Attendant	100 00
Lawrence Guerin, Assistant Attendant	100 00
Wm. Lawson, Assistant Attendant	100 00
E. J. McDermott, Assistant Attendant	100 00
Thos. F. Norman, Assistant Attendant	100 00
R. E. Shanklin, Assistant Attendant	100 00
C. A. Sutcliffe, Assistant Attendant	100 00
L. S. Whittington, Assistant Attendant	100 00
Miss N. Bolton, Assistant Attendant	100 00
Mrs. S. Burnette, Assistant Attendant	100 00
Blanche Choate, Assistant Attendant	100 00
Anna Fahey, Assistant Attendant	100 00
Mrs. V. Goodwin, Assistant Attendant	100 00
Miss K. Govere, Assistant Attendant	100 00
Mrs. E. O'Donnell, Assistant Attendant	100 00
Dora Smith, Assistant Attendant	100 00
Helen Smith, Assistant Attendant	100 00
Carrie Dalton, Waitress, A. D. R. Male Department	100 00
Mrs. F. Keemon, Waitress, Convalescent Cottage	100 00
Harriet Peterson, Assistant Waitress, Receiving Building	100 00
Nora Prendergast, Assistant Waitress, Female Building	100 00
Mrs. M. Sterling, Assistant Waitress, Receiving Building	100 00

STOCKTON STATE HOSPITAL—Continued.

Name and Title	Monthly Salary
J. R. Wilson, Sewer Tender	100 00
L. A. Carson, Vegetable Man	95 00
John Pedroni, Kitchen Help	95 00
Rose Frances, Assistant	90 00
John Repp, Assistant	90 00
Etta Birney, Assistant	90 00
Harriet Schuster, Cook, Dr. Clark's Residence	90 00
D. F. Feehan, Assistant	85 00
W. E. Ford, Assistant	85 00
Goldie Springer, Assistant	85 00
Robert Hall, Assistant	85 00
A. Lutz, Vegetable Man	85 00
Emma Denevi, Cook, Dr. Tuggle's Residence	85 00
Angela Portillo, Cook, Dr. Sanderson's Residence	85 00
\$51.00 to \$75.00.	
H. W. Lyons, Treasurer	70 00
W. Stevenson, Teamster	75 00

COMMISSION OF IMMIGRATION AND HOUSING OF CALIFORNIA.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
R. Justin Miller, Attorney and Executive Officer	\$333 33
Ethel Richardson, Director of Immigration Education	250 00
Edward A. Brown, Director of Camp Sanitation	250 00
R. W. Kearney, Complaint Officer	200 00
Esther Rujaro, Special Investigator	200 00
Leo T. Mott, Camp Inspector	175 00
Arthur Johnson, Fresno Agent	175 00
Mrs. A. S. Calhoun, Los Angeles Agent	175 00
Otto H. Biernath, Interpreter	160 00
Antone Scar, Camp Inspector	160 00
E. J. Walther, Sacramento Agent	160 00
Florence Smith, Bookkeeper	150 00
Milton E. Edwards, Camp Inspector	150 00
Elise Harlan, Housing Inspector	150 00
Eleanor Del Carlo, Secretary to Executive Officer	140 00
Dorothy Huggins, Stenographer	110 00
Kathryn Quinn, Stenographer	110 00
Mrs. Jennie B. Gowdy, Stenographer	100 00
Anna Renucci, Stenographer	85 00
Helen Breckenridge, Stenographer	75 00
Gene Colicchia, Messenger	60 00

Statement of the number of persons engaged for temporary or emergency employment during the fiscal year ending June 30, 1920, and the total amount expended for such temporary or emergency employments.

	Monthly Salary
Miss E. Howard, Investigator	\$50 00
M. S. Carrizosa, Interpreter	208 00

INDUSTRIAL ACCIDENT COMMISSION.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
Will J. French, Commissioner	\$416 65*
A. J. Pillsbury, Commissioner	416 65*
A. H. Naftzger, Commissioner	416 65*
H. M. Wolfin, Superintendent of Safety	416 65
A. E. Graupner, Attorney	333 33
T. W. Osgood, Assistant Superintendent of Safety	325 00
H. L. White, Secretary	300 00
F. B. Lord, Manager, Compensation Department	300 00
W. H. Pillsbury, Compensation Expert and Referee	300 00
M. R. Gibbons (M.D.), Medical Director	300 00†
R. L. Hemingway, Chief Boiler Inspector	300 00
R. L. Eltringham, Electrical Engineer (Resigned January 21, 1921)	300 00
G. Chester Brown, Chief Mine Inspector	300 00
J. J. Rosedale, Safety Engineer	300 00
W. P. Ratliff, Statistician and Superintendent of Self Insurance	275 00
J. Wesley Gebb, Deputy Mine Inspector	275 00

*Statutory.

†Part-time.

INDUSTRIAL ACCIDENT COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
F. L. Lowell, Deputy Mine Inspector	275 00
L. D. Miller, Safety Engineer	275 00
E. O. Allen, Referee	250 00
W. W. Britton, Referee	250 00
L. C. Brown, Referee	250 00
A. D. D'Ancona, Referee	250 00
H. C. Kelsey, Referee	250 00
D. McPherson, Jr., Traveling Referee	250 00
Dr. R. W. Harbaugh, Assistant Medical Director	250 00†
Dr. F. E. Raynes, Assistant Medical Director	250 00†
F. W. Fellows, Assistant Secretary	250 00
Dr. H. E. Southworth, Assistant Medical Director	250 00†
G. E. Kimball, Electrical Enquirer	250 00
F. A. Page, Boiler Inspector	240 00
J. S. Thomas, Assistant Secretary	225 00
E. E. Purrington, Accountant	225 00
L. N. Crowell, Decision Writer	225 00
R. E. Haggard, Superintendent Permanent Disability Rating Department	225 00
C. C. Bradford, Boiler Inspector	225 00
C. F. Toklas, Safety Engineer	225 00
A. Wade, Boiler Inspector	225 00
F. A. Short, Electrical Inspector	225 00
L. O. Adams, Assistant Secretary	225 00
W. H. Hogue, Traveling Reporter	215 00
A. H. Agaton, Boiler Inspector	215 00
D. H. Harris, Elevator Inspector	215 00
E. F. Owens, Elevator Inspector	215 00
C. A. Trahn, Elevator Inspector	215 00
A. J. Barrett, Elevator Inspector	200 00
W. E. French, Elevator Inspector	190 00
M. Grimes, Jr., Elevator Inspector	190 00
L. Rouble, Chief Clerk	190 00
George Klinger, Safety Inspector	185 00
Al Wilson, Elevator Inspector	180 00
Charles R. True, Boiler Inspector	175 00
B. Evans, Boiler Inspector	175 00
C. R. Macdonald, Chief Clerk	175 00
Louise Pedrotta, Chief Reporter	165 00
Elmer M. Shunk, Special Investigator	162 50
Mary F. Ward, Clerk-Stenographer	160 00
A. Henshall, Reporter	160 00
Grace Littler, Reporter	160 00
Georgina Woodall, Reporter	160 00
May Humphreys, Reporter	160 00
Blanche Sameth, Reporter	160 00
Margaret McGuire, Clerk-Stenographer	155 00
W. F. Beem, Clerk	150 00
Loretto Jordan, Clerk	150 00
J. J. Taheny, Clerk	150 00
E. Asplund, Reporter	150 00
Lorraine Bradley, Stenographer-Clerk	150 00
Mildred Adams, Special Agent	150 00
Rose Marshall, Reporter	150 00
Oscar Cornelissen, Special Investigator	150 00
H. Hale, Stenographer-Clerk	145 00
Enid Cohen, Stenographer-Clerk	140 00
Dora Knox, Stenographer-Clerk	140 00
Geneva Blake, Stenographer-Clerk	140 00
A. O. Hansen, Clerk	130 00
Mabel Taft, Stenographer	125 00
Sophie Hink, Stenographer	125 00
Alice Cragan, Telephone Operator	125 00
Bertha Endrich, Stenographer	125 00
E. Stewart, Multigraph Operator	125 00
Irene Cowell, Secretary-Stenographer	125 00
Sara Foster, Proof Reader	125 00
Clara Imes, Secretary-Stenographer	125 00
Genevieve McMahon, Stenographer	125 00
Elizabeth Brand, Reporter	125 00
A. Bowen, Clerk	125 00
Harriet Emerson, Special Agent	125 00
Esther Johnson, Clerk	125 00
Undine Russell, Stenographer	125 00
L. B. Mallory, Referee-Fresno	125 00*
B. Staples, Stenographer	120 00
M. Bird, Stenographer	120 00
Amy McGrath, Stenographer	120 00
Fenrietta Schneider, Stenographer	120 00
S. McLaughlin, Clerk	120 00

*Statutory.

†Part-Time Service.

INDUSTRIAL ACCIDENT COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
M. Chance, Stenographer	120 00
Essie Partain, Clerk	120 00
J. P. Zipf, Clerk	120 00
Eleanor Lyman, Dictaphone Operator	115 00
Virginia Rae, Stenographer	115 00
Mrs. C. Fairchild, Stenographer	115 00
P. Krupa, Stenographer	115 00
P. Scheuble, Stenographer	115 00
May Rolfe, Dictaphone Operator	115 00
Gladys Waibel, Clerk	115 00
Lucy S. Coen, Stenographer	115 00
Irene Kloety, Stenographer	115 00
Ethel Brown, Stenographer	110 00
Cora Pettit, Clerk	110 00
Elsie Eaden, Clerk	110 00
Amy Wells, Clerk	110 00
Gertrude Bradley, Dictaphone Operator	110 00
Alberta Ewart, Clerk	110 00
C. Burke, Stenographer	105 00
Daisy Blake, Stenographer	105 00
Edwarda Pickett, Typist	100 00
Mrs. C. Kennedy, Stenographer	100 00
Ruth Hannan, Typist	100 00
Celestine McCarthy, Typist	100 00
William Leslie, Actuary	100 00*
Lillian Waldron, Typist	100 00
Lillian Sidey, Stenographer	100 00
Ethel Bettes, Typist	95 00
Mildred Bray, Clerk	95 00
Grace Stillson, Copyholder	95 00
Leona Hamner, Dictaphone Operator	90 00
Gertrude Brown, Stenographer	90 00
Myrtle Mitchell, Clerk	90 00
Frances Brand, Typist	85 00
Edith Hughes, Typist	85 00
L. McLean, Clerk	85 00
Josephine Scannell, Typist	80 00
J. German, Messenger	75 00
A. J. Monroe, Referee	41 66†
A. J. Bischoff, Referee	41 66†
George H. Johnson, Referee	41 66†
J. C. Brenna, Janitor	30 00†

During the seventy-first fiscal year, ending June 30, 1920, the Industrial Accident Commission employed thirty-two (32) temporary and emergency employees, at a cost of

\$2,016 68

The above does not include those employees who substituted or served only for short periods of time in a permanent position, but only those who were employed on temporary or emergency work.

INDUSTRIAL FARM FOR WOMEN, SONOMA.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary or Daily Wage
Blanche Morse, Executive Secretary	\$250 00 per month
Donald McIntosh, Assistant to the Superintendent	200 00 per month
August Castagnet, Farm Hand	4 00 per day
D. M. McIntosh, Farm Hand	3 50 per day

*Statutory

†Part-time service.

INDUSTRIAL HOME FOR THE ADULT BLIND.

Salaries of Employees.

Name and Position	Cash	Maintenance	Total
D. Keith, Superintendent	\$175 00	\$35 00	\$210 00*
T. A. Williston, Chief Clerk	125 00	70 00#	195 00
C. P. Dempsey, Chief Cook	115 00	35 00	150 00
E. E. Darling, Assistant Clerk	90 00	35 00	125 00
J. W. Cummings, Engineer	95 00	24 00	119 00
Mrs. R. E. Keith, Matron	75 00	35 00	110 00
J. T. Tate, Second Cook	65 00	35 00	100 00
A. F. Maine, M.D., Physician	100 00	---	100 00*
Mrs. H. Amyot, Assistant Matron	60 00	35 00	95 00
J. M. Donohue, Watchman	60 00	35 00	95 00
F. K. Taylor, Gardener	60 00	35 00	95 00
Mrs. E. Johnson, Assistant Matron	55 00	35 00	90 00
J. P. Lee, Janitor	55 00	35 00	90 00
Ed. McVerney, Laborer	55 00	35 00	90 00
C. F. Barnhisel, Dishwasher	45 00	35 00	80 00
Miss M. Flood, Waitress	45 00	35 00	80 00
Mrs. E. J. Doney, Waitress	45 00	35 00	80 00
Mrs. E. Peterson, Waitress	45 00	35 00	80 00
Miss R. Johnson, Waitress	45 00	35 00	80 00
Miss C. Koger, Waitress	45 00	35 00	80 00
Miss M. Santos, Waitress	45 00	35 00	80 00
W. David, Cleaner	45 00	35 00	80 00†
R. Tate, Assistant Janitor	45 00	35 00	80 00
G. S. Meredith, Secretary	50 00	---	50 00*
H. P. Francis, Reader	15 00	---	15 00†

Salaries of sighted employees in the shops. These employees are paid from the earnings of the shops and are not paid from State appropriations.

Name and Position	Cash	Maintenance	Total
A. T. Johnson, Shop Foreman	\$175 00	\$6 00	\$181 00
Miss E. B. Smith, Teacher	75 00	24 00	99 00
H. P. Francis, Chauffeur	60 00	35 00	95 00
Miss M. Richter, Teacher	50 00	35 00	85 00

No temporary or emergency help.

INDUSTRIAL WELFARE COMMISSION.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
A. B. C. Dohrmann, Chairman of Commission	\$10 00*
Katherine Philips Edson, Executive Commissioner	10 00*
Also an allowance of \$3.00 per diem, general expense, to supplement the former per diem to the amount of \$360 per month.	
Walter G. Mathewson, Commissioner	10 00*
Alexander Goldstein, Commissioner	10 00*

	Monthly Salary
Marian L. Mel, Assistant Secretary	175 00
Ethel R. Palmer, Southern California Representative	175 00
Elizabeth Macdonald, Chief Clerk	175 00
Isabel Hall, Special Agent	150 00
Murgery Lynch, Special Agent	150 00
Elsa Lissner, Special Agent	150 00
Clarice Zion, Special Agent	150 00
Thelma Miller, Stenographer	150 00
Dorothy Johnston, Special Agent	125 00
Dorothy Miles, Special Agent	125 00
Margaret Poole, Special Agent	125 00
Gertrude Lachman, Stenographer	100 00
Ruth P. Mount, Stenographer	100 00
Unfilled, Stenographer	100 00
Georgiana Carden, Special Investigator Industrial Education	75 00†
Georgie Mathewson, Statistical Clerk	65 00†

	Daily Wage
William E. Hubbard, Consulting Engineer	\$15 00†

(Maximum of 7 per diems per month.)

Fourteen (14) persons were employed for temporary or emergency work during the fiscal year ending June 30, 1920. \$1,033.30 was expended for such temporary and emergency work.

Respectfully submitted: Industrial Welfare Commission: by Elizabeth Macdonald, Chief Clerk.
February 8, 1921.

#Self and Wife.

*Statutory Position.

†Part-Time Service.

DEPARTMENT OF INSURANCE.

San Francisco, February 12, 1921.

State Civil Service Commission, Sacramento, California.

Gentlemen: The following is a list of the employees of this Department, their salaries and titles, as requested in your circular letter of recent date:

Insurance Department, State of California.

Alexander McCabe, Insurance Commissioner.

Name of Officer or Employee and Title	Monthly Salary
Alexander McCabe, Insurance Commissioner.....	\$500 00#
John F. Barry, Examiner.....	300 00†
Fred P. Cooper, Examiner.....	300 00†
Victor Montgomery, Actuary.....	300 00
Samuel H. Beckett, Examiner.....	250 00
Raymond Benjamin, Attorney.....	250 00
H. F. Risbrough, Deputy Insurance Commissioner.....	225 00#
E. F. Mitchell, Assistant to Commissioner.....	225 00
M. E. Barr, Chief Clerk.....	165 00
L. M. Gilmore, Stenographer.....	150 00
A. M. Weisse, Stenographer, Los Angeles Office.....	150 00
M. O. Tinkham, Stenographer.....	125 00
E. E. James, Statistician.....	125 00
P. M. Tonges, Statistician.....	125 00
J. F. Bailey, Clerk, Los Angeles Office.....	100 00
F. de Ganna, Typist.....	100 00
Geneveve Lyman, Typist.....	100 00
G. L. Standley, Typist.....	95 00
J. J. Kenny, Stenographer.....	90 00
Milton San Facon, Messenger.....	65 00

Extra typists are required during the rush period, toward the end of the fiscal year, to as speedily as possible place in the hands of the many thousands of agents and brokers the new licenses necessary to the legal conduct of their business. During 1920 the total compensation of twenty-six extra typists so employed was \$1,655.94.

Yours very truly, Alexander McCabe, Insurance Commissioner.

BUREAU OF LABOR STATISTICS DEPARTMENT.

(Report of officers and regular employees of the Bureau of Labor Statistics on January 1, 1921.)

February 7, 1921.

San Francisco.

Name of Officer or Employee and Title	Monthly Salary
John P. McLaughlin, Commissioner.....	\$333 30*
William Gardner, Statistician and Chief Examiner.....	225 00*
B. B. Rosenthal, Deputy Commissioner.....	200 00*
Albert T. Roche, Attorney.....	200 00*
Harry Gorman, Field Agent.....	190 00
J. P. Denehy, Field Agent.....	175 00
David McLennan, Special Agent.....	165 60
E. F. Gallatin, Special Agent.....	165 00
D. J. O'Neill, Special Agent.....	165 00
Katherine Kelly, Stenographer and Bookkeeper.....	165 00
E. A. Williams, Statistical Clerk.....	150 00
Florence Burns, Stenographer.....	125 00
Nora O'Callaghan, Stenographer.....	125 00
Sarah H. Byrne, Stenographer.....	125 00
Mary L. Powers, Stenographer.....	125 00
Evelyn Corbett, Stenographer.....	125 00

#Salaries paid out of General Fund. All other salaries and expenses are paid from special fund supported by fees and collections of department. (These collections are largely in excess of expenditures.)

†Section 597 of the Political Code of this state provides that all examinations of insurance companies must be made at the expense of the companies. The state is charged with their salaries only when assigned by the Commission to the investigation of reports, etc., filed with the department.

*Statutory Position.

†Part-Time Service.

BUREAU OF LABOR STATISTICS DEPARTMENT—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Los Angeles.	
Name of Officer or Employee and Title	Monthly Salary
Bertha L. Cable, Deputy Commissioner.....	200 00*
Raymond Shively, Field Agent.....	190 00
M. M. Lyon, Assistant Deputy Commissioner.....	175 00*
Harry Epstein, Special Agent.....	165 00
T. W. Bromley, Special Agent.....	165 00
C. W. Holbrook, Special Agent.....	165 00
Flora Frannin, Stenographer.....	125 00
Sacramento.	
John S. Blair, Assistant Deputy Commissioner.....	200 00
Anna E. Purdy, Stenographer.....	150 00
San Diego.	
Benjamin H. Taylor, Assistant Deputy Commissioner.....	200 00
Martha Moore, Stenographer.....	65 00†
Fresno.	
L. B. Mallory, Assistant Deputy Commissioner.....	115 00†
Wanda M. Hanscomb, Stenographer.....	100 00*

Public Employment Bureaus Department.**San Francisco.****Men's Department, 933 Mission Street.**

Name of Officer or Employee and Title	Monthly Salary
C. B. Sexton, Superintendent.....	\$225 00†
H. H. Fitzgerald, Manager.....	190 00†
J. P. McLaughlin, Jr., Placement Clerk.....	165 00
J. P. O'Connell, Placement Clerk.....	150 00
A. A. Rosborough, Clerk.....	150 00
C. O. Johnson, Placement Clerk.....	140 00
J. J. Lane, Placement Clerk.....	140 00
J. H. Manning, Placement Clerk.....	140 00
T. J. Walsh, Placement Clerk.....	140 00

Women's Department, Pacific Building.

Mrs. L. M. Hall, Manager.....	150 00
May L. Harrington, Stenographer.....	125 00

Oakland.

Mrs. H. Power, Manager.....	175 00
R. H. Finnell, Placement Clerk.....	140 00
W. L. Juri, Placement Clerk.....	140 00
Geo. F. Ryan, Placement Clerk.....	140 00
Mary A. Dempsey, Placement Clerk.....	125 00

Sacramento.

F. W. Chapman, Manager.....	165 00
G. F. Chorley, Placement Clerk.....	140 00

Fresno.

William G. Mans, Manager.....	175 00
J. J. Maher, Placement Clerk.....	140 00

San Jose.

George F. Moody, Manager.....	165 00
T. F. Graham, Placement Clerk.....	140 00

Los Angeles.

E. H. Hancock, District Superintendent.....	200 00
R. M. Cutron, Manager.....	180 00
Erma B. Summers, Placement Clerk.....	150 00
Blanche Halbert, Manager.....	150 00
S. L. Mayer, Jr., Placement Clerk.....	150 00
A. O. Sanchez, Placement Clerk.....	150 00
Alice L. Hogan, Placement Clerk.....	140 00
L. W. Burdette, Placement Clerk.....	140 00
F. R. Sattler, Placement Clerk.....	140 00
I. N. Barnett, Placement Clerk.....	140 00
I. K. Carr, Placement Clerk.....	140 00
Hal McLean, Placement Clerk.....	140 00

*Statutory.

†Part-time service.

‡Returned from leave of absence February 1, 1921.

Public Employment Bureaus Department—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Los Angeles—Continued.

Name of Officer or Employee and Title	Monthly Salary
Lucy Malin, Placement Clerk.....	125 00
Irene L. Powers, Placement Clerk.....	125 00
Maude C. Wilkie, Placement Clerk.....	125 00
Ruby Bell, Placement Clerk.....	115 00
Florence Thurman, Telephone Operator.....	100 00

Stockton.

John A. Greene, Manager.....	150 00
Frank Waterman, Placement Clerk.....	140 00

Chico.

H. L. Miller, Manager.....	150 00
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Marysville.

J. S. Quinn, Manager.....	150 00
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DELHI LAND SETTLEMENT.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
W. E. Packard, Superintendent.....	\$333 33
M. B. Williams, Chief Engineer.....	333 33
M. E. Cook, Engineer.....	250 00
J. R. Jahn, Engineer.....	250 00
E. C. Fortier, Engineer.....	235 00
O. W. Shattuck, Auditor.....	200 00
H. B. Said, Engineer.....	175 00
L. N. Brown, Orchardist.....	170 00
R. F. Kretz, Bookkeeper.....	150 00
T. M. Temple, Pipe Plant Foreman.....	150 00
A. L. Epstein, Engineer.....	150 00
Sidney Lee, Levelman.....	135 00
Paul Wilcox, Rodman.....	135 00
John Woodbridge, Rodman.....	125 00
Eric Olson, Rodman.....	115 00
G. W. Peters, Junior Architectural Draftsman.....	115 00
J. C. Hocker, Timekeeper.....	100 75
Tom Herron, Stableman.....	100 00
Ira Wasson, Stenographer.....	100 00
E. W. Peters, Stenographer and Secretary.....	100 00
Edgar Horne, Storekeeper.....	87 12
W. M. Bostaph, Levelman.....	77 44
R. H. Morgan, Rodman.....	74 19
Arthus Ross, Rodman.....	18 55

179 persons engaged for temporary or emergency employment during the fiscal year ending June 30, 1920. Total amount, \$37,010.09.

STATE LAND SETTLEMENT BOARD—DURHAM OFFICE.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Salary or Wage
Geo. C. Keutzer, Superintendent.....	\$333 33 per month
H. H. Dingman, Accountant.....	125 00 per month
Margaret Marshall, Stenographer-Cashier.....	100 00 per month
Earl Fogarty, Engineering Assistant.....	75 00 per month
F. M. Butler, Laborer.....	45 cents per hour
H. P. Bonnickson, Yard Foreman.....	45 cents per hour

Total number of men employed for the fiscal year ending June 30, 1920..... 576
Total amount expended for temporary or emergency employment as shown above..... \$25,362 96

LEGISLATIVE COUNSEL BUREAU.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
George B. Bush, Legislative Counsel.....	\$333 33
Frederick B. Wood, Assistant Counsel.....	225 00
John A. McGilvray, Assistant Counsel.....	200 00
Theodora S. Crase, Stenographer.....	100 00

†Part-Time Service.

CALIFORNIA STATE LIBRARY.

Sacramento, California.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Milton J. Ferguson, State Librarian.....	\$416 65*
Mabel R. Gillis, Assistant State Librarian.....	250 00
Mrs. Laura Steffens Suggett, Branch Librarian.....	225 00
Jos. H. Quire, Law and Legislative Reference Librarian.....	200 00
Susan T. Smith, Reference Librarian.....	200 00
Mrs. May Dexter Henshall, Organizer.....	185 00
Endora Garoutte, Head, California Department.....	175 00
Alice J. Haines, Head, Documents Department.....	175 00
Wm. H. Lugg, Head, Shipping, Repair, etc.....	175 00
Ida G. Munson, Head, Catalog Department.....	175 00
H. C. Peterson, Collector of Californiana.....	175 00
Beulah Mumin, Library Instructor.....	165 00
Kate M. Foley, Home Teacher of the Blind.....	150 00
Florence Lamb, Bookkeeper.....	150 00
Annie Lowry, In Charge of Periodicals and Binding.....	150 00
Myrtle Ruhl, In Charge of Book Orders and Accessions.....	150 00
Helen M. Bruner, Assistant.....	135 00
Polly Fenton, Assistant.....	135 00
Wm. G. Lyons, Clerk.....	135 00
N. Ruth McCullough, Assistant.....	135 00
M. Ruth McLaughlin, Assistant.....	135 00
Blanche L. Shadle, Assistant.....	135 00
Caroline E. Wenzel, Shelf Lister.....	135 00
Anna Creaner, Assistant.....	125 00
Mary Katherine Ray, Assistant.....	125 00
Mrs. Vivian Gregory Smith, Assistant.....	125 00
Bessie B. Heath, Assistant.....	120 00
D. Florence Montfort, Assistant.....	120 00
Marguerite Walker, Stenographer.....	120 00
Ella A. Clark, Indexer.....	110 00
Frances Haub, Assistant.....	110 00
Anita Khopf, Stenographer (Sutro Branch).....	110 00
Marie Lamont, Assistant.....	110 00
Wyman Pease, Clerk.....	110 00
Mary V. Provines, Assistant.....	110 00
Lily Tilden, Assistant.....	110 00
Beryl Andrews, Assistant.....	100 00
Mrs. Gerna R. Dickson, Assistant.....	100 00
Sara P. Driver, Assistant.....	100 00
J. L. Foss, Janitor.....	100 00
G. A. Klees, Janitor.....	100 00
Mrs. Evelyn Prentiss McKevitt, Assistant.....	100 00
Catharine J. Morrison, Home Teacher of the Blind.....	100 00
R. N. Polmire, Janitor.....	100 00
Harry Simons, Elevator Operator.....	100 00
Mrs. Dorothy Clarke Worden, Assistant.....	100 00
Benneta Colton, Typist.....	90 00
Emma F. deMerritt, Book Repairer.....	90 00
Mrs. Thelma A. Foss, Book Repairer.....	90 00
Laura Manhart, Assistant.....	90 00
Mrs. Olive M. Treichler, Assistant.....	90 00
Mae Davies, Book Repairer.....	85 00
Mrs. Faye M. French, Assistant.....	85 00
Mrs. Mae Moore, Book Repairer.....	85 00
Lucile E. Ernst, Assistant.....	75 00
Anna McAnear, Typist and Dictaphone Operator.....	75 00
Beth McIntire, Messenger.....	75 00
Ida Smith, Messenger.....	75 00
Rose F. Butler, Assistant.....	70 00
Margaret Kilgariff, Assistant.....	70 00
Mrs. Eleanor H. Meads, Assistant.....	70 00
Irene Ryan, Assistant.....	70 00
Angelena Grant, Messenger.....	65 00
Jennie Gilwitz, Assistant.....	60 00
Willie Milling, Messenger.....	60 00
Grace Raub, Assistant.....	60 00
Theodore Milling, Messenger.....	50 00
Line In Fitzell, Messenger.....	50†
Eleven persons have been employed for temporary work during the last fiscal year for which we paid the following total amount.....	\$795 75

*Statutory.

†Per hour.

STATE COMMISSION IN LUNACY.

Name of Officer or Employee and Title	Monthly Salary
F. W. Hatch, General Superintendent.....	\$416 66
E. S. Birdsall, Secretary.....	250 00
Earl D. White, Attorney.....	250 00
Chas. F. Waymire, Deportation Agent.....	225 00
E. G. Twogood, Assistant Secretary.....	200 00
Geo. Huestis, Financial Agent.....	175 00
Ruth M. Morse, Stenographer.....	125 00
Pearl M. Stockdale, Filing Clerk.....	85 00

(Persons employed for temporary or emergency employment during the fiscal year ending June 30, 1920.)

Number of Persons and Title

1 Typist.....\$3 00 per day when employed

STATE MARKET COMMISSION AND THE STATE FISH EXCHANGE.

List of permanent employees.

State Market Commission.

Name and Title	Monthly Salary
Gilbert B. Daniels, State Market Director.....	\$416 65
F. N. Bigelow, Secretary.....	300 00
Mabel E. Worth, Stenographer.....	125 00
Madeline Spear, Stenographer.....	110 00
Olive Oppermann, Stenographer (temporary employee filling permanent position).....	110 00
Eunice Bailey, Clerk.....	100 00

State Fish Exchange.

James P. Britt, Deputy.....	250 00
Mrs. D. F. Shaw, Assistant Secretary.....	175 00
J. H. Joy, Deputy.....	140 00
S. Quartararo, Deputy.....	125 00
Blanche Le Sage, Stenographer.....	110 00
E. M. Brough, Deputy.....	60 00
J. L. Leonard, Deputy.....	50 00
Alfred McCarthy, Deputy.....	50 00

Total.....\$2,121 65

Total amount expended during fiscal year ending June 30, 1920 for temporary or emergency employees (State Market Commission).....\$225 50

Total amount expended during fiscal year ending June 30, 1920 for temporary or emergency employees (State Fish Exchange).....638 57

Total.....\$864 07

Total number of persons employed during the fiscal year ending June 30, 1920, on temporary or emergency work (State Market Commission).....20

Total number of persons employed during the fiscal year ending June 30, 1920, on temporary or emergency work (State Fish Exchange).....13

Total.....33

D. Fairchild Shaw, Assistant Secretary.

MARSHALL'S MONUMENT.

G. W. Morrill, Guardian.

Coloma, February 1, 1921.

Honorable State Civil Service Commission, and State Board Control.

Gentlemen: (By request tender data and information required.)

Name and Title	Compensation
Ga'en W. Morrill, Guardian.....	\$75 00*
James B. Connor, Laborer (6 days at \$4.00).....	24 00†

Yours truly, G. W. Morrill, Guardian.

*Statutory position. †Part-time service.

BOARD OF MEDICAL EXAMINERS.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
1. Harry A. Encell, Chief Counsel.....	\$300 00
2. Charles B. Pinkham, Secretary Treasurer.....	250 00*
3. H. J. Castellaw, Special Prosecutor.....	250 00
4. Frank M. Smith, Special Prosecutor.....	250 00†
5. Charles D. Ballard, Associate Counsel.....	200 00
6. H. G. Henderson, Special Agent.....	175 00
7. J. M. O'Connell, Special Agent.....	175 01
8. Ethel McDonald, Chief Clerk (Sacramento).....	160 00
9. Marie Butterly, Stenographer (Sacramento).....	150 00
10. Albert Carter, Assistant Special Agent (Los Angeles).....	150 00
11. Angel C. Favatt, Assistant Special Agent (San Francisco).....	150 00
12. Evelyn Dalton, Stenographer (San Francisco).....	125 00
13. Florence Almquist, Clerk (Sacramento).....	120 00
14. Carmellita Williams, Bookkeeper (Sacramento).....	110 00
15. Alice Carter, Stenographer (Los Angeles).....	100 00
16. Margaret McKinney, Stenographer (San Francisco).....	100 00
17. Eva Rogers, File Clerk (Sacramento).....	85 00
18. Frank Boniface, Janitor (Sacramento).....	10 00
Temporary employees—	
Number 35 (employed at odd intervals when necessity demanded) Operators and Clerks. Total amount expended from July 1, 1919-June 30, 1920.....	2,719 19
Board Members (9) per diem of \$10.00 when Board is in session for regular meetings of special committee meetings. Total amount expended from January 1, 1920-January 1, 1921.....	2,095 00

STATE MINING BUREAU.

Report of Officers and Regular Employees Employed by this Department on January 1, 1921.

\$451.00—\$500.00.		Monthly Salary
Name of Officer or Employee and Title		
F. McN. Hamilton, State Mineralogist.....		\$416 66*
R. P. McLaughlin, State Oil and Gas Supervisor.....		506 00*
\$301.00—\$350.00.		
J. B. Case, Chief Deputy.....		333 33
Irving V. Augur, Deputy Oil and Gas Supervisor.....		300 00
R. M. Barnes, Deputy Oil and Gas Supervisor.....		300 00
Clifford C. Thomas, Deputy Oil and Gas Supervisor.....		300 00
\$251.00—\$275.00.		
L. Vander Leek, Engineer and Geologist.....		275 00
W. W. Thayer, Secretary.....		250 00*
Archibald M. Johnson, Attorney Oil Department.....		250 00*
M. H. Soyster, Deputy Oil and Gas Supervisor.....		250 00
H. B. Thomson, Deputy Oil and Gas Supervisor.....		250 00
\$201.00—\$225.00.		
E. S. Boalich, Mining Engineer.....		220 00
W. B. Tucker, Chief Field Assistant.....		220 00
W. W. Bradley, Mining Statistician.....		210 00
\$176.00—\$200.00.		
E. Hugenia, Petroleum Engineer.....		200 00
C. A. Logan, Field Assistant.....		190 00
\$151.00—\$175.00.		
Frank Sanborn, Petrographer.....		175 00
C. McK. Laizure, Field Assistant.....		175 00
Frank D. Gore, Petroleum Engineer.....		175 00
F. M. Smith, Petroleum Engineer.....		175 00
Martin Van Couvering, Petroleum Engineer.....		175 00
\$123.00—\$150.00.		
Sam Perry, Inspector.....		150 00
Clement D. Meserve, Inspector.....		150 00
R. E. McCabe, Inspector.....		150 00
P. S. Haury, Inspector.....		150 00
A. O. Hadden, Inspector.....		150 00
Harry Godde, Inspector.....		150 00
W. W. Copp, Inspector.....		150 00
Charles L. Clark, Inspector.....		150 00

*Statutory.

†These employees are on a fee basis but make an average of about \$250 per month.

STATE MINING BUREAU—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

\$126.00—\$150.00—Continued.

Name of Officer or Employee and Title	Monthly Salary
J. J. McDonald, Assistant Mining Statistician.....	150 00
Alice M. Rankin, Chief Clerk.....	150 00
F. M. Zeigler, Inspector.....	150 00
Rose Wagener, Chief Clerk.....	150 00
Harry Stevens, Geological Draftsman.....	150 00
S. S. McNair, Inspector.....	150 00
Emma Cooney, Stenographer.....	135 00

\$101.00—\$125.00.

Mary E. Bowler, Stenographer.....	125 00
Eleanore A. Brown, Clerk.....	125 00
Iva G. Porter, Stenographer.....	125 00
Alma T. Murphy, Stenographer.....	125 00
A. H. Brod, Laboratory Assistant.....	125 00
Esta Brooks, Stenographer.....	125 00
Margaret Faulkner, Draftsman.....	125 00
Clifford Jones, Geological Draftsman.....	125 00
Wallace Martin, Inspector.....	125 00
Simon Merenbach, Geological Draftsman.....	125 00
E. Schroeder, Inspector.....	125 00
H. F. Williams, Janitor and Storeroom Clerk.....	125 00
George McKenzie, Janitor.....	115 00
Lillian C. Holcomb, Stenographer.....	115 00
Arthur Nagel, Night Watchman.....	110 00

\$76.00—\$100.00.

Edward Denniston, Janitor.....	100 00
Eva M. Galbraith, Stenographer.....	100 00
Alma Klink, Stenographer.....	100 00
Mrs. Florence Lee, Stenographer.....	100 00
Katherine McDonald, Stenographer.....	100 00
Kate Molitor, Stenographer.....	100 00
Lena Owen, Stenographer.....	100 00
Mrs. Adele M. Pope, Stenographer.....	100 00
Mrs. Geraldine Prendergast, Stenographer.....	100 00
Francis Eugene Kennedy, Geological Draftsman.....	100 00
Marguerite Lewis, Stenographer.....	85 00

\$51.00—\$75.00.

Genevieve Peterson, Switchboard Operator.....	70 00
Ida C. Greenfield, Stenographer.....	60 00
Mervin Walp, Janitor.....	35 00
A. Ferrarri, Janitor.....	12 50

BOARD OF TRUSTEES OF THE OLD CUSTOM HOUSE AT MONTEREY.

Monterey, California, February 4, 1921.

State Civil Service Commission, Sacramento, California.

Gentlemen: The name of this Department is the "Board of Trustees of the Old Custom House" at Monterey, California. The Board consists of the following members: Grant Towle, Geo. S. Gould, Jr., Wm. Sandholdt Jr., Carmel Martin and Florence Porter Pfingst, of which the following are the officers: Grant Towle, President; Geo. S. Gould, Jr., Secretary; Wm. Sandholdt, Jr., Treasurer.

None of said members or officers receive any compensation nor has there any money been spent for any employees during 1920. We have no salaried officers or employees connected with this Department.

Very truly yours, Grant Towle, President.

MOTOR VEHICLE DEPARTMENT.

Report of Officers and Regular Employees Employed by this Department
on January 1, 1921.

Name of Officer or Employee and Title	Monthly Salary
Charles J. Chenu, Superintendent	\$300 00
Stephen Neal, Chief Inspector	225 00
L. W. Butler, Manager Los Angeles Office	225 00
Wm. H. Marsh, Cashier	215 00
H. L. Hapgood, Office Manager	200 00
D. F. Jerauld, Auditor	200 00
E. L. Bruch, Inspector	190 00
Michael F. Brown, Inspector	175 00
Gladys Carroll, Assistant to Superintendent	175 00
H. D. Cloughley, Inspector	175 00
George T. Gilroy, Inspector	175 00
Philip Godley, Assistant Auditor	175 00
James T. Gormley, Carpenter	175 00
C. K. Harder, Inspector	175 00
Louis LaPlace, Inspector	175 00
L. A. Manning, Inspector	175 00
G. F. Moynahan, Inspector	175 00
A. J. Healy, Manager San Francisco Office	175 00
S. G. Benedict, Cashier Los Angeles Office	175 00
R. C. Brewer, Inspector	175 00
Ethel Kay, Manager Fresno Office	165 00
Elithe Kelleher, Manager San Diego Office	160 00
S. L. Blodgett, Shipping Clerk	155 00
E. Frank Peterson, File Clerk	150 00
Mattie S. York, Department Head	150 00
E. S. Allen, Clerk	150 00
Clara A. Hammill, Department Head	145 00
A. Van Ewyk, Clerk	135 00
Vonnie L. Armstrong, Assistant Manager San Francisco Office	135 00
Howard S. Harris, Assistant Cashier	135 00
Belle Johnson, In Charge Complaint Division	130 00
Rose S. Cordano, Assistant Cashier	125 00
Josephine Cowan, Assistant Dealer Supervisor	125 00
Mrs. Nell Kennedy, Department Head	125 00
Irma F. Russell, Stenographer and Clerk	120 00
Kathryn DeVere, Charge T-S Writers	120 00
Margaret J. Dolan, Stenographer	120 00
Mrs. V. L. Crocker, Department Head	115 00
Mrs. George Huber, Rate Clerk	115 00
Jewel H. Lowry, Rate Clerk	115 00
Margaret M. Smith, Stenographer and Rate Clerk	115 00
Mrs. Anna E. Morris, Assistant Cashier	115 00
Marie Nealis, Rate Clerk	115 00
Elmer Steinmeyer, Clerk	115 00
Harvey Bernard, Clerk	115 00
Ida M. Misphey, Rate Clerk	115 00
Slyva E. Andrews, Rate Clerk	115 00
Mrs. Agnes Cadman, Rate Clerk	115 00
Mrs. Elta M. Richards, Rate Clerk	115 00
Helen Higgins, Counter Rate Clerk	110 00
Robt. M. Payne, Janitor	110 00
Mrs. Hazel Watson, Stenographer	110 00
Rena E. Wilson, Bookkeeper	110 00
Clifford B. Arney, Laborer	110 00
M. T. Gratz, Shipping Clerk	110 00
Ada Grier, Assistant Cashier	110 00
Mary V. Stafford, Rate Clerk	110 00
Juanita Mills, Counter Clerk	110 00
W. S. Moores, Rate Clerk	110 00
Pearl C. Morgan, Stenographer	110 00
Mrs. A. D. Allen, Rate Clerk	105 00
Mrs. E. T. Lathrop, Stenographer and Clerk	105 00
Zelma Noyes, Rate Clerk	105 00
Ruth Oates, Rate Clerk	105 00
Mrs. Julia Rader, Charge Department	105 00
Mrs. O. W. Wulff, Special Claim Clerk	105 00
Mary Casey, Typist	105 00
Ada Ford, Rate Clerk	100 00
Edward White, Laborer	100 00
Agnes Gallagher, Certificate Writer	100 00
Anne E. Gardner, Assistant Cashier	100 00
Esther Shinn, Typist	100 00
Myrtle L. Gibbs, Proof Reader	100 00
Merced Sullivan, Charge Zone Clerks	100 00
Oneida Wilhelm, Assistant Rate Clerk	100 00
Ethel M. Boden, General Information	100 00
Camillus Duffy, Rate Clerk	100 00
Lola D. McReynolds, Clerk	100 00
Ivan H. Parker, Jr., Cashier's Desk	100 00
Winfred Russell, Typist	100 00

MOTOR VEHICLE DEPARTMENT—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Mrs. A. E. Schilling, Charge Department	100 00
Louise Brooks, Assistant Cashier	100 00
Dorothy Sharps, Stenographer	95 00
Mrs. Catherine Becker, File Clerk	95 00
Esther E. Crockett, Office Manager's Assistant	95 00
Josephine DuVal, Comptometer Operator	95 00
J. E. Kent, File Clerk	95 00
Kathryn M. Lawrence, Typist	95 00
Margaret McAnaw, Certificate Writer	95 00
Grace McDermott, Certificate Writer	95 00
Celia M. Moe, Typist	95 00
Margaret Roddy, Typist	95 00
Catherine J. Tomich, Typist	95 00
Helen I. Wall, Certificate Writer	95 00
Mrs. Nettie Bernhard, Clerk	95 00
Dawn E. Crooks, Certificate Writer	95 00
Helen Douglas, File Clerk	95 00
Marie Kreuzberger, Typist	95 00
Frances M. Rogers, File Clerk	95 00
Margaret Sullivan, Certificate Writer	95 00
Ada Wickstrom, Typist	95 00
Lethadell A. Wilson, Stenographer	95 00
Grace Woods, Rate Clerk	95 00
Grace C. Zarick, Typist	95 00
Marie Domingas, Typist	95 00
Margaret Brackett, Stenographer	95 00
Mrs. Mae Emerson, Typist	95 00
Lucy A. Hillman, Typist	95 00
Sarah Pollard, Stenographer	95 00
Margaret Rudd, Typist	95 00
Lucille E. Aitken, Certificate Writer	90 00
Anne B. Averill, Proof Reader	90 00
Nevada Bader, Proof Reader	90 00
Daphne Bottorff, Clerk	90 00
Ruth Glacklin, Typist	90 00
Mary Guisto, Clerk	90 00
Cora E. Higgins, File Clerk	90 00
Claire King, File Clerk	90 00
Coral E. Porter, Certificate Writer	90 00
Josephine Woodmansee, Clerk	90 00
Itobina J. Alexander, Mail Clerk	90 00
Ruth Assalena, Assistant Rate Clerk	90 00
Mrs. E. L. Brown, File Clerk	90 00
Hazel R. Brown, Clerk	90 00
Ida Butler, Clerk	90 00
Bessie Estey, Stenographer	90 00
Anabel Flanagan, T-S Writer	90 00
Margaret Flemming, Assistant Rate Clerk	90 00
Anna M. Gastman, Typist	90 00
Henry H. Hatch, File Clerk	90 00
Ida Kelso, File Clerk	90 00
Cora O'Brien, Clerk	90 00
Marguerite Schmidt, T-S, Writer	90 00
Murrice Sheehan, Clerk	90 00
Elsie G. Sherwood, Clerk	90 00
Frances Tomick, Typist	90 00
Mary S. Touhey, File Clerk	90 00
Dorothy Remmer, Typist	90 00
Ada Brooks, Assistant Cashier	90 00
Mrs. Woodye Stewart, Clerk	90 00
Mrs. Anna Fletcher, Typist	90 00
Donna Duffy, Typist	85 00
Mrs. B. C. Derr, File Clerk	85 00
Mrs. Bertha J. Earl, Clerk	85 00
Virginia Guisto, Clerk	85 00
Mrs. Emma E. Harney, File Clerk	85 00
Doris B. Larke, File Clerk	85 00
Mary E. Schwan, File Clerk	85 00
Mrs. Jennie Short, File Clerk	85 00
Dorothea B. Smith, Clerk	85 00
Bertha Todd, Clerk	85 00
Mrs. Lucile D. Wharton, Assistant Rate Clerk	85 00
Esther Bloomberg, File Clerk	85 00
Mabel Bowman, Telephone Operator	85 00
Evelyn Carpenter, Typist	85 00
Florence Finchley, Assistant Rate Clerk	85 00
Ernestine Friedel, Typist	85 00
E. M. Lyons, Proof Reader	85 00
Mrs. M. H. Small, File Clerk	85 00
Alice M. Wall, Proof Reader	85 00
Victoria E. Torosian, Stenographer	85 00
C. M. Abbott, Typist	85 00

MOTOR VEHICLE DEPARTMENT—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Mary Elmhurst, Stenographer	85 00
Ethel Fairclough, Typist	85 00
Florence Gregory, Typist	85 00
Mrs. Edith Goodin, Typist	85 00
Charlotte Levin, Typist	85 00
Beulah Maudlin, Telephone Information	85 00
Julia Macnamara, Stenographer	85 00
Margaret Quail, Proof Reader	85 00
Mrs. Lesley M. Carlisle, Clerk	80 00
Mrs. Lottie G. Dowle, Clerk	80 00
Lolita O'Connor, Clerk	80 00
Cora E. Stelter, Clerk	80 00
Louise K. Woods, Typist	80 00
Irene Balsz, Certificate Writer	80 00
Ruth Banks, Clerk	80 00
Mrs. Pearl Burnett, Proof Reader	80 00
Marguerite Camenzind, Typist	80 00
Viola Driver, Clerk	80 00
Mrs. Albertine Jones, Proof Reader	80 00
Mildred LeRoy, Clerk	80 00
Edna H. Lyons, Clerk	80 00
Virginia O'Brien, Typist	80 00
Rose E. Parker, Typist	80 00
Kathleen Furl, Duplicator Operator	80 00
Clara A. Cave, Clerk	75 00
Nellie L. Ennis, Clerk	75 00
Josetta Holt, Typist	75 00
Grace L. Klotz, Proof Reader	75 00
Nellie Maultby, Clerk	75 00
Lou H. Peterson, Clerk	75 00
Mrs. Ambrose Johnson, Clerk	75 00
Daisy Stoughton, Clerk	75 00
Mrs. Pearl Agner, Clerk	75 00
Lena Alderson, Clerk	75 00
George V. Anderson, Duplicator Operator	75 00
Mrs. Clara Bennett, Matron	75 00
Lulu Bower, Clerk	75 00
Lucy A. Byrne, Clerk	75 00
Ella Calvert, File Clerk	75 00
Louise Edwards, Clerk	75 00
Georgie Ellsworth, File Clerk	75 00
Anna Folsom, Clerk	75 00
Mrs. O. F. Kohman, Clerk	75 00
Mrs. Gussie H. Lynn, Proof Reader	75 00
Lottie McRae, Clerk	75 00
Earl Nicolaus, Messenger	75 00
Lillian Smith, Clerk	75 00
Addie Van Voast, Clerk	75 00
Zitka Wilhelm, Clerk	75 00
Maude R. Wilson, Clerk	75 00
Genevieve Kennedy, Messenger	70 00
Kate Costella, Clerk	70 00
Rose Hershkowitz, Messenger	70 00
Mayme Potter, Clerk	70 00
Dolores Dashiell, Messenger	65 00
Elaine Conrad, Messenger	65 00

Name of Officer or Employee and Title	Daily Wage
Leonard Van Buskirk, Shipping Clerk	4 50
Charles B. Addison, Laborer	4 00
D. R. Baldwin, Laborer	4 00
Timothy J. Healy, Laborer	4 00
Albert Lewis, Laborer	4 00
Reuben Woolf, Laborer	4 00
James Whalen, Laborer	4 00

Temporary employees for the year ending June 30, 1920—376 employees, \$56,497.38.

CHICO STATE NORMAL SCHOOL.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
C. M. Osenbaugh, President	\$400 00
E. I. Miller, Supervisor History	266 66
C. K. Studley, Vice President	266 66
E. L. Cole, Education	250 00
E. A. Powers, Supervisor English	205 00
M. E. Meriam, Education	187 50
Bertha C. Cady, Supervisor Biological Science	183 33
Eva M. Ealand, Supervisor Manual Art	180 00
Lida Lennon, Supervisor Music	180 00
Clara M. McQuade, Supervisor Grammar and Literature	180 00
Emma A. Wilson, Supervisor Training School	180 00
Anna Louise Barney, Dean of Women	175 00
Saidee E. Stark, Supervisor Home Economics	165 00
Carl J. Schreiter, Supervisor Manual Training	160 00
Marion B. Barbour, Supervisor Sub-Primary	158 33
Gay E. McLaren, Assistant Home Economics	150 00
Isa D. Reed, Assistant Training School	150 00
Mabel Whitmore, Supervisor Art	150 00
Sara A. Doyle, Assistant Training School	145 33
Clara Kaps, Assistant Training School	141 66
Alice Sproul, Teacher Rural School	141 66
Cora A. Covey, Supervisor Physical Education	133 33
Walter Hann, Supervisor Maintenance and Construction	166 66
Alice Anderson, Librarian	150 00
Gladys Ingraham, Assistant Secretary	120 00
J. Albright, Engineer and Janitor	116 66
Henry Locey, Gardener	105 00
George Lowry, Janitor	105 00
Chas. McClard, Janitor	105 00

Daily Wage

Annie J. Robinson, Cafeteria Cook----- 4 00

Monthly Salary

Isabel Martin, Librarian, Training School	20 00
Grace Jessen, Assistant Librarian	†
Yvette Baker, Assistant Librarian	†

No per diem or extra maintenance allowed.

Summer Session.

Persons Engaged for Temporary and Emergency Work During Fiscal Year Ending June 30, 1920.

M. Blanche Cummings, Primary Methods, Summer Session	\$119 23
Lillian Brown, Physical Education, Summer Session	119 23
Annie S. Baldock, Cook, Summer Session	76 00
Mayme L. Sayer, Manager, Cafeteria, Summer Session	66 00
Alma J. Fee, Kitchen Labor, Summer Session (1919-20)	95 00
Mrs. Julia Morgan, Assistant Cook, Summer Session	36 00
Mrs. Robinson, Cafeteria Cook, Summer Session	40 00
Floyd Hann, Carpenter Labor	170 00
Vera Baldock, Kitchen Labor	8 00
Homer Knight, Labor on Grounds	10 50
Earl Bacus, Labor on Grounds	9 00
Roy A. Lowry, Labor on Grounds	11 00
Andrew Mullen, Labor on Grounds	50 00
John Bruce, Labor with Team	3 50
Geo. W. Long, Labor on Grounds	20 00
Brett Deveney, Repairs, Labor	12 25
P. M. Hull, Extra Janitor Service	14 60
Mrs. Lillian Ackeman, Janitor Work, Kindergarten	6 30
Ray Britton, Extra Janitor Work	17 50
Brett Deveney, Extra Janitor Work	19 25
Mrs. Robinson, Extra Kitchen Labor	31 50
Gladys Pearce, Hectograph Work	7 50
C. B. Whitmoyer, Teaching Chemistry	84 00

Total Expended----- \$1026 36

Total of 23 persons employed.

Chico State Normal School: By C. M. OSENBAUGH, President.

February 11, 1921.

†Paid at rate of 35 cents per hour, approximately \$11 per month, each.

FRESNO STATE NORMAL SCHOOL.

Fresno, California.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
C. L. McLane, President	\$450 00
F. W. Thomas, Vice-President	320 00
G. W. Graves, Director, Agriculture	240 00
W. B. Givens, Director, Manual Arts	240 00
G. H. Huntting, English	240 00
Emory Ratcliffe, Economics	240 00
P. F. Valentine, Principal, Training Department	240 00
A. G. Wahlberg, Director, Music	240 00
H. J. King, Science	220 00
E. W. Lindsay, Rural Education	220 00
Maude E. Schaeffer, Dean of Women	215 00
Alexandra Bradshaw, Director, Art	205 00
Imogene Kriskey, Director Physical Education	205 00
Blanche W. Taft, Director, Home Economics	205 00
Grace Allingham, Assistant Home Economics	180 00
Cora Burdick, Assistant Home Economics	180 00
Juliet Dixon, Assistant Physical Education	180 00
Katherine Dukes, Assistant Art	180 00
Edna Orr James, Assistant Education	180 00
Elizabeth Peterson, Assistant Music	180 00
Felita M. Smith, Assistant Education	180 00
Frances J. Whitlock, Assistant Art	180 00
John Finity, Mechanic and Engineer	165 00
Margaret Wear, Supervisor, Training Department	165 00
Ida Baker, Supervisor, Training Department	160 00
Floralyn Cadwell, Supervisor, Training Department	160 00
Kathryn Daly, Supervisor, Training Department	160 00
Nellie Hamilton, Supervisor, Training Department	160 00
Marian Powell, Supervisor, Training Department	160 00
Agnes Tobin, Librarian	160 00
Bernice Teague, Recorder	125 00
D. A. Gordan, Janitor	100 00
Freda Van Fleet, Office Assistant	90 00
Louis W. Frech, Gardener	90 00
W. H. Whitlow, Gardener	90 00
Fred Marcellus, Assistant Engineer	55 00†
Mrs. W. P. Miller, Lecturer	50 00†
Mrs. D. A. Gordan, Janitress	50 00†
Harold Wahlberg, Assistant Engineer	50 00†
Erwin Martin, Assistant Janitor	45 00†
Roy Larson, Assistant Janitor	45 00†
Roy McConnell, Assistant Janitor	45 00†
Mary Gorrell, Assistant Librarian	40 00†
Thelma Steinwand, Assistant Music	25 00†
Hazel Thomas, Assistant Music	25 00†

†Employed part time.

HUMBOLDT STATE NORMAL SCHOOL.

Arcata, California.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Range of Salary—\$201.00 to \$400.00.

Name of Officer or Employee and Title	Monthly Salary
N. B. Van Matre, President	\$375 00
Bena K. Hansen, Teacher	222 00
Cassa B. Graves, Rural Supervisor	216 00
E. E. Balcomb, Teacher	210 00
L. Viola Waller, Teacher	204 00
Oliver E. Irons, Teacher	204 00
Range of Salary—\$51.00 to \$200.00.	
A. G. Sly, Teacher	200 00
R. H. Jenkins, Teacher	196 36
Mabel Wilson, Teacher	188 00
Estelle Brandewie, Teacher	180 00
Virginia C. Bacon, Librarian	155 00
J. W. Rose, Janitor	105 00
Jessie L. Turner, Secretary	75 00
Ida Ingraham, Clerical Assistant	30 00†
Frank Decker, Teamster with team	9 00†
Charles Grotzman, Teamster with team	9 00†
John Lima, Laborer	5 00†
Lawrence Geisler, Laborer	5 00†
Carrie Rose, Assistant Janitor, 5 hours per day at \$.40 per hour	2 00†
Harvey McCummon, Assistant Janitor, 4 hours per day at \$.40 per hour	1 60†

†Per day.

†Half days.

STATE NORMAL SCHOOL OF SAN DIEGO.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Edward L. Hardy, President	\$450 00
W. F. Bliss, Vice President	235 00
Miriam A. Besley, Director of Education	275 00
Wm. T. Skilling, Instructor in Agriculture and Nature Study	241 00
Caroline Townsend, Instructor in Education and Reading	241 00
Agnes Moore Fryberger, Instructor in Music	240 00
Irving E. Outcalt, Instructor in English	235 00
Edith Wengel, Instructor in Home Economics	230 00
Ada Hughes Coldwell, Dean of Women	223 75
Jessie B. Tanner, Instructor in Physical Education	223 75
Vinnie B. Clark, Instructor in Geography	216 00
Georgia V. Coy, Instructor in Biology	216 00
Chas. R. Scudder, Instructor in Manual Training	216 00
Florence L. Smith, Acting Principal of Training School	191 66
Alice Greer, Supervisor Sixth Grade	183 27
Charlotte Robinson, Librarian	180 00
Florence Bryant Delane, Registrar	168 00
Bulah Marker, Instructor in Industrial Arts	168 00
Ethel Cunningham, Supervisor Fourth Grade	168 00
Edith C. Hammack, Supervisor First Grade	168 00
Mary Benton, Instructor in Fine Arts	167 08
C. R. McLaughlin, Chief Engineer	155 00
F. W. Van Horne, Head Janitor and Custodian	155 00
Mary Spayd, Supervisor Second and Third Grades	154 16
John Snyder, Supervisor Seventh Grade	154 16
Gertrude S. Bell, Director Tests and Measurements	133 52
C. L. Fisk, Assistant Engineer and Janitor	133 33
Martin Roth, Head Gardener	133 33
Thekla K. Rice, Assistant Secretary	129 16
A. L. Seelig, Janitor Training School	125 00
Mary Bower, Assistant Instructor in Physical Education	120 83
Otto Young, Assistant Gardener	116 66
Winifred Woods, Librarian Training School	115 83
George Averbeck, Janitor Main Building	112 50
T. A. Wier, Night Watchman	112 50
Jennie E. Adams, Instructor in Typing, and Faculty Secretary	108 33
George Gerhard, Assistant Gardener	108 33
Ethel Bailey, Instructor in French	70 00
Berta Lynch, Instructor in Spanish	70 00
Hazel Ball, Assistant in Training School	50 00
Chesley Mills, Director of Orchestra	45 83
Freda Kronowitter, Helper in Cafeteria	40 00
Frances Sterne, Spanish in Training School	35 00
Sadie Seelig, Helper in Cafeteria	32 00
J. A. Carpenter, Bookkeeper	25 00

STATE NORMAL SCHOOL AT SAN FRANCISCO.

Pay roll as of January 1, 1921.

1	Frederic Burk, President	\$450 00
2	Archibald Anderson, Dean	300 00
3	A. S. Boulware, Supervisor	225 00
4	Esther Gaw, Supervisor	215 00
5	Thomas Thompson, Supervisor	210 00
6	Anna Hillesheim, Supervisor	210 00
7	Effie McFadden, Supervisor	210 00
8	Nellie Neal, Supervisor	210 00
9	Mary Ward, Supervisor	210 00
10	Sarah Barrows, Supervisor	210 00
11	D. R. Augsburg, Supervisor	200 00
12	Candis Nelson, Supervisor	200 00
13	Olive Thompson, Supervisor	190 00
14	Cecelia Anderson, Supervisor	175 00
15	Helen Davis, Supervisor	175 00
16	Alice Leutzker, Supervisor	175 00
17	Marion O'Neill, Supervisor	175 00
18	Frank Ray, Supervisor	175 00
19	Katherine Hussey, Business Secretary	175 00
20	Mary McCauley, Supervisor	170 00
21	Albertina Richards, Supervisor	166 66
22	Alice Spelman, Supervisor	165 00
23	Eva Levy, Supervisor	165 00
24	Florence Vance, Supervisor	165 00
25	Clara Crumpton, Supervisor	160 00
26	Lucy Cuddy, Supervisor	160 00
27	Hilda Smith, Supervisor	160 00
28	Fern Alderson, Supervisor	155 00
29	Grace Carter, Assistant Supervisor	150 00

*Salaries paid in ten installments instead of twelve.

†Part time.

STATE NORMAL SCHOOL AT SAN FRANCISCO—Continued.

Name of Officer or Employee and Title	Monthly Salary
30 Jessie Casebolt, Assistant Supervisor.....	150 00
31 Bertha Taylor, Assistant Supervisor.....	150 00
32 Ethel England, Supervisor.....	145 00
33 Mildred Holman, Librarian.....	145 00
36 Florence Hale, Assistant Supervisor.....	140 00
37 Ruth Seymour, Librarian.....	135 00
38 Albert Pfaender, Engineer.....	125 00
39 Anna Stoval, Supervisor.....	125 00†
40 Nina Kenagy, Supervisor.....	120 00†
41 David Mitchell, Gardener.....	120 00
42 Ellen Stadtmuller, Supervisor.....	100 00†
43 Katrine Macdonald, Stenographer-substitute.....	100 00
44 Mabel Gifford, Supervisor.....	100 00†
45 George Marshall, Watchman.....	85 00
46 Nels Hanson, Janitor.....	75 00†
47 Louis de Nicola, Janitor.....	65 00†
48 Sarah Gordon, Janitress.....	65 00†
49 Joe Wilson, Janitor.....	60 00†
50 Virgil Dickson, Supervisor.....	50 00†
51 Estelle Carpenter, Supervisor.....	25 00†
Total.....	\$7,786 66

Temporary or emergency work during year ending June 30, 1920.

	Per hr.	Salary
1 Marjorie Adams, Stenographer.....	\$0.50	\$103 75
2 Mildred Bannerman, Library Work.....	.25	79 25
3 Mabel Benson, Pianist.....	.50	1 25
4 Grace Beukes, Library Work.....	.25	11 90
5 Otille Brandt, Library Work.....	.25	3 00
6 Grace Boucher, Library Work.....	.25	15 50
7 Edith Chunen, Library Work.....	.25	7 00
8 W. Decker, Pianist.....	.50	12 00
9 Marion Dickson, Pianist.....	.50	4 00
10 Laura Dunn, Pianist.....	.50	2 50
11 Muriel Frieberg, Library.....	.25	35 00
12 Dorothy Gansburger, Pianist.....	.50	46 90
13 Grace Goodman, Pianist.....	.50	3 25
14 Vena Hanson, Library.....	.25	13 55
15 Mary Hardiman, Library.....	.25	8 75
16 Frances Horgan, Clerical.....	.25	257 20
17 Irene Jacobs, Pianist.....	.50	30 00
18 Nora Kelly, Labor-Janitress.....	.50	61 60
19 Elizabeth Kelly, Pianist.....	.50	9 50
20 Gertrude Kesseler, Stenographer.....	.50	6 50
21 Clara King, Stenographer.....	.50	1 00
22 E. Laraira, Clerical.....	.25	3 50
23 Otis La Ross, Typing.....	.25	2 45
24 Clara Love, Stenographer.....	.50	14 00
25 McCurdy, Pianist.....	.50	20 75
26 McDowell, Library and Mimeograph.....	.25	75 40
27 McFarland, Stenographer.....	.50	5 00
28 J. Molten, Clerical.....	.25	6 00
29 Helen Murray, Clerical.....	.25	204 35
30 Bernice Powell, Pianist.....	.50	7 25
31 Mary Sample, Library.....	.25	8 50
32 R. Sandell, Library.....	.25	7 00
33 M. Schultz, Stenographer.....	.50	46 00
34 Irene Sink, Library.....	.25	18 50
35 Ruth Vela, Stenographer.....	.50	4 00
36 Emily Windelle, Library.....	.25	11 50
37 F. Berrien, Carpenter..... (per day) \$7.00		19 25
38 Joseph Dougherty, Repair Work.....	.50	28 00
39 Wm. McCarthy, Repair Work and Janitor.....	.50	311 50
40 Samuel Sutton, Repair Work.....	.50	92 00
Total.....		\$1,598 35

†Part-time.

SAN JOSE STATE NORMAL SCHOOL.

San Jose, California, February 1, 1921.

Name and Title	Monthly Salary
Dr. W. W. Kemp, President	\$500 00
Yetta Shoninger, Teacher	285 00
L. B. Wilson, Vice President	283 00
Dr. L. J. Stockton, Principal Training School	283 00
Helen Sprague, Dean and Teacher	247 83
H. F. Minssen, Financial Secretary and Teacher	205 00
Karl Hazeltine, Teacher	190 00
Margaret McPheeters, Supervisor	186 00
W. H. Baker, Teacher	185 83
Alice Bassler, Teacher	185 83
Carolyn Bradley, Teacher	185 83
Flora Beal, Teacher	185 83
Susan Byrne, Teacher	185 83
Dr. H. M. Bland, Teacher	185 83
Rebecca English, Teacher	185 83
Ida M. Fisher, Teacher	185 83
Clara Hinz, Teacher	185 83
Elizabeth McFadden, Teacher	185 83
Isabel MacKenzie, Teacher	185 83
Charlotte Morton, Teacher	185 83
Gertrude Rowell, Teacher	185 83
Lulu Sours, Teacher	185 83
Corinne Davis, Teacher	185 82
Clara Smith, Teacher	185 83
B. J. Spaulding, Teacher	185 83
Mrs. F. Hambleton, Department Teacher	185 00
Sylvia Wallace, Teacher	180 00
Anna Wiebalk, Teacher	180 00
Ettie Kinney, Teacher	169 16
Helen Mignon, Teacher	166 66
Katherine Hall, Department Teacher	164 16
Henrietta Riebsam, Department Teacher	164 16
Martha Trimble, Department Teacher	164 16
Helen Evans, Librarian	160 83
Elizabeth Schroder, Department Teacher	159 16
Lulu Wunderlich, Department Teacher	159 16
Bessie McCabe, Department Teacher	157 50
Blanche Bradley, Teacher	155 00
Estella Hoisholt, Teacher	155 00
Margaret Twombly, Teacher	155 00
Ruth Wooster, Teacher	155 00
Mabel Crumby, Teacher	155 00
Isabel Waterman, Teacher	150 00
Edith Ruebsam, Teacher	150 00
Mrs. E. Groathead, Registrar	150 00
Mary Sweet, Secretary to President	150 00
Hazel Whitmire, Teacher	145 00
Emily Nixon, Department Teacher	144 16
Clarence Urmey, Teacher	141 66
Eleanor Gratz, Assistant Dean and Teacher	140 00
Winifred Estabrook, Assistant Librarian	125 00
Alma Prouty, Teacher	119 16
Dr. Bullock, Physical Advisor	116 66
Ethel Rodda, Assistant Teacher	105 83
Julia LaShelle, Assistant Teacher	103 00
Leola Burchell, Assistant Teacher	103 00
Mary Bean, Assistant Teacher	99 16
Anita Colambet, Assistant Teacher	99 16
W. Williams, Assistant Teacher	94 16
Almira Mitchell, Assistant Teacher	94 16
Rovilla Bates	93 33
Alice Cronin, Secretary	91 66
Mrs. G. Williams, Tr. School Librarian	90 83
Alice Howell, Assistant Teacher	85 83
George Schultzberg, Rural School Assistant	60 00
M. Rianda, Assistant Secretary Tr. School	50 00
N. deLorenzo, Assistant in Music	25 00
A. E. Lake, Truant Officer	22 50
Joseph Stillwell, Custodian	145 00
R. Pearce, Engineer	140 00
T. S. Hollingsworth, Head Gardener	130 00
J. Echkardt, Engineer	121 66
W. J. Juarez, Assistant Gardener	101 66
Lorenzo Cantue, Assistant Gardener	101 66
J. J. Mulholland, Carpenter	100 00
Mrs. R. Smith, Janitress	93 33
J. B. Webster, Janitor	90 00
Charles Ingomells, Janitor	90 00
George Moberley, Janitor	90 00
F. M. Perry, Janitor	88 33
W. H. Wilson, Night Watchman	80 00
Carolyn Van Patten, Assistant Janitor	20 00

Number of persons employed for temporary or emergency relief, 15; total expended \$1,020.

SANTA BARBARA NORMAL SCHOOL.

(Report of officers and regular employees employed on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary or Daily Wage
C. L. Phelps, President	\$416 66
Mary H. Tracy, Dean	263 33
Charlotte Ebbets, Director, Home Economics	213 33
Frederick Horridge, Director, Manual Arts	213 33
A. Irene Struthers, Director, Art Department	213 33
Winifred Frye, Head, Domestic Art Department	205 83
Susanna Rogers, Head, Physical Education	205 00
William Ashworth, Head, English Department	200 00
Kathryn Long, Director, Training Department	200 00
Raymond Moshler, Head, Music Department	200 00
Alice Bradley, Instructor, Home Economics	180 00
Mary E. Crosswell, Instructor, Art Department	190 00
Hazel E. Severy, Head, Chemistry Department	200 00
Clara Youngs, Instructor, Home Economics	180 00
Winifred Weage, Instructor, Physical Education	166 66
William Rust, Instructor, Manual Arts	175 00
Mrs. Jane C. Miller, Secretary	150 00
H. B. Thomas, Superintendent Building and Grounds	130 00
Norma Corey, Registrar and Financial Secretary	125 00
Mrs. Mabel Sampson, Instructor, Home Economics	125 00
Aldene Winham, Librarian	125 00
George Jones, Janitor and Gardener	95 00
C. H. Smick, Janitor and Gardener	95 00
Mrs. C. Murphy, Janitress	90 00
Marie O'Malley, Assistant Janitress	75 00

Monthly Salaries in Ascending Scales Showing Number in Each Group.

\$51 to \$75—1	\$201 to \$225—5
76 to 100—3	226 to 250
101 to 125—3	251 to 275—1
126 to 150—2	276 to 300
151 to 175—2	301 to 350
176 to 200—7	351 to 400

\$401 to \$450—1

This is a complete list of the employees of this institution as well as a complete statement of all compensation received by said employees.

C. L. Phelps, President Santa Barbara Normal School.

CALIFORNIA STATE BOARD OF OPTOMETRY.

Office of Secretary.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Yearly Compensation
J. C. Crawford, Secretary	\$600 00*
John M. Forsyth, J. M. Crawford, Herman Davis, constitute the Board.	
They draw \$16 per diem for each day of attendance at Board meetings.	
Total per diem for the year ending June 30, 1920	470 00

Temporary employees.

Harriet Crawford, Stenographer and Clerk: Total	779 35†
Sundry attorneys: Total fees paid	300 00†
Sundry investigators and operators	187 60†

PACIFIC COLONY.

(Report of officers and regular employees employed by this institution on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Dr. W. C. Rappleye, Superintendent	\$200 00†
C. W. Peck, Executive Secretary	175 00
and maintenance	140 00
Agnes Frisius, Stenographer	50 00†
Lila Mattison, Stenographer and Office Secretary	50 00†
Mode Frasure, Farm Hand	90 00

Daily wage

Walter Gleason, Farm Hand	\$4 00†
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Pacific Colony, during the fiscal year ending June 30, 1920, engaged eight (8) persons for temporary or emergency employment at a total expenditure of \$840.91, which amount includes the sum of \$385.50, which was expended for office work.

*Statutory position.

†Part-time service.

PACIFIC COLONY—Continued.

The persons receiving this latter sum were three in number and each in turn acted as office secretary and stenographer. This total sum also includes some team hire, in which connection sometimes one man was employed with a team of two and sometimes of four horses, the total team hire included in the above total sum of \$840.91 amounting to \$283.

In other words, the total sum expended for temporary or emergency employments, during the above mentioned period, and, not including the team hire, was \$557.91.

CALIFORNIA STATE BOARD OF PHARMACY.

E. T. Off, Pasadena, H. B. Meader, Oakland, J. O. McKown, Livermore, H. J. Flinger, Santa Barbara, Raymond G. Lindley, Fresno, E. J. Molony, San Francisco, J. S. O'Callaghan, San Francisco; 306 Flood Building, Market at Powell Street, San Francisco, California.

(Report of officers and regular employees employed by this department on January 1, 1921.)

California State Board of Pharmacy.

Name of Officer or Employee and Title	Monthly Salary or Daily Wage
Louis Zeh, Secretary, permanent	\$300 00
Edward T. Reilly, Inspector, temporary	190 00
Fred H. Roberts, Inspector, permanent	190 00
Fred A. Lion, Inspector, temporary	185 00
W. B. Luckenbach, Inspector, temporary	185 00
Fred C. Boden, Inspector, temporary	180 00
Roy Jones, Inspector, temporary	180 00
Chris Hansen, Inspector, temporary	175 00
Charles D. Dickinson, Inspector, temporary	165 00
D. R. Dunbar, Inspector, temporary	165 00
T. J. McInerney, Inspector, temporary	165 00
C. E. Peoples, Inspector, temporary	165 00
Harry Charmak, Inspector, permanent	150 00
Ethel Wigley, Clerk-Stenographer, permanent	140 00
Mrs. T. C. Everitt, Clerk-Stenographer, permanent	125 00
Marietta Flynn, Stenographer, temporary	90 00
W. R. Dickinson, Inspector, permanent, (Local, Los Angeles)	30 00

NOTE—Maintenance Inspectors: Three meals per day, single quarters \$3 per day. No maintenance of any kind allowed in San Francisco, Oakland or Los Angeles. Actual traveling expenses of Secretary.

STATE BOARD OF PILOT COMMISSIONERS.

H. Z. Howard, President, Alfred Greenebaum, George E. Wallace; Hugh M. Burke, Secretary.

Office 311 Merchants Exchange.

San Francisco, February 9, 1921.

State Civil Service Commission, Sacramento, California.

Gentlemen: In reply to your kind letter of January 28, 1921, the State Board of Pilot Commissioners for San Francisco, Mare Island, Vallejo and Benicia find that the form enclosed is not applicable to the statutes governing our Commission, but the following report in triplicate will supply the information desired:

1. Name of Commission—State Board of Pilot Commissioners for San Francisco, Mare Island, Vallejo and Benicia.

Number of Commissioners—three (appointed by the Governor), namely: H. Z. Howard, Alfred Greenebaum and George E. Wallace, of San Francisco.

Secretary—Hugh M. Burke, San Francisco.

The Commissioners do not receive compensation from the treasury of the State. They receive monthly five per centum of the pilotage collected, from which they pay the salary of the Secretary (\$160 per month), rent of office, 311 Merchants Exchange Building (\$25 per month); also charges for stenography, printing, telephone and other expenses. The compensation is fixed by law and no money is drawn from the State.

2. The law authorizes the Commission to appoint not more than twenty and not less than fifteen bar pilots and two bay and river pilots. The pilots hire their own help, purchase their provisions, subsist the crew, provide their own boats, pay for repairs, rent, insurance, and consul fees from the pilotage collected, and apportion the residue to the pilots. They do not receive any money from the State government.

The regulations governing the pilots were adopted by the Pilot Commissioners on May 12, 1891. Since January 1, 1915, the rates of pilotage in this port have been reduced 33 1/3 per cent and are now acceptable to the shipping interests and conform to the charges for pilotage in the ports of New York, Boston, Philadelphia, Baltimore, Norfolk, New Orleans, Galveston, Liverpool and, in fact, all other great ports of the world.

The pilots are capable, intelligent men of character and ability, who undergo rigid examinations as to their qualifications in seamanship before a license is issued by the Commissioners.

Yours very truly, State Board of Pilot Commissioners. H. Z. Howard, President; Hugh M. Burke, Secretary.

PIO PICO MANSION TRUSTEES.

Miss Nova J. Beal, Secretary, State Civil Service Commission.

Dear Madam: Your esteemed favor is at hand, and I note the official enquiry relative to the status of employment at the Pio Pico Mansion. As there is no one paid in connection therewith it is impossible for me to fill in the blanks as requested.

The family living in the house have paid no rent and been paid no salary. They have been there for eight years giving good care to keep the place in order.

Very truly, (Signed) Harriet W. R. Strong, Chairman Trustees Pio Pico Mansion.

CALIFORNIA POLYTECHNIC SCHOOL.

(Report of officers and regular employees employed by this institution on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary or Daily Wage
M. H. Chase, Vice Director and Head of Academic Department.....	\$260 00†
R. W. Ryder, Director	250 00†
F. M. Watson, Instructor and Head of Agricultural Department.....	240 00†
E. H. Bendel, Instructor and Head of Engineering Mechanics Department	240 00†
R. S. Hayslip, Instructor	220 00†
B. M. Howe, Instructor	220 00†
J. T. Saunders, Instructor	220 00†
M. Skartedt, Instructor	220 00†
H. C. Figge, Instructor	210 00†
H. Hess, instructor	200 00†
L. B. Hawk, Instructor	200 00†
B. B. Hoover, Instructor, Head of Domestic Science Department.....	200 00†
J. G. Hudspeth, Instructor	200 00†
E. A. Weller, Instructor	200 00†
H. N. Whitlock, Instructor	200 00†
B. A. Williams, Instructor	200 00†
M. L. Yeary, Instructor	200 00†
J. C. Deuel, Instructor, (\$155.00-\$35.00 maintenance).....	190 00†
W. D. Simpson, Bookkeeper	175 00
M. M. Bland, Registrar, Secretary, Office Manager, Substitute teacher.....	150 00
H. C. Kinsman, Farm Superintendent	150 00
J. H. Perozzi, Superintendent, Power, Heat and Light	150 00
M. B. Stedman, Librarian	139 78†
*C. O. Dyer, Carpenter	125 00
C. G. Clark, Dairyman, Assistant Animal Husbandry	125 00
*C. C. Page, Horticulturist	125 00
George Matts, Horseman, Assistant Animal Husbandry	110 00
L. Broughton, Assistant Engineer	115 00
*A. Smith, Head Cook (\$100.00-\$35.00 maintenance).....	135 00†
*F. Smith, Second Cook (\$100.00-\$35.00 maintenance).....	135 00†
*C. Diennning, Kitchen Helper (\$75.00-\$35.00 maintenance).....	110 00†
*R. McCutcheon, Kitchen Helper (\$75.00-\$35.00 maintenance).....	110 00†
*Josie Smith, Kitchen Helper (\$75.00-\$35.00 maintenance).....	110 00†
*John Waspi, Kitchen Helper (\$75.00-\$35.00 maintenance).....	110 00†
E. Simon, Horseman, Assistant Animal Husbandry	100 00
W. W. Vernon, Farm Laborer	100 00
J. Kortlick, Farm Laborer	100 00
C. Steiner, Typist and Clerk	100 00
*G. Silverio, Janitor	100 00
*H. Clark, Janitor	90 00
R. C. Wood, Light Auto Truck Driver	100 00
A. Davis, Night Power Plant Operator (student).....	30 00
*H. Bock, Dormitory Laundry Checker Student.....	10 00†
*E. Burr, Student Janitor	15 00†
*S. Guyton, Student Janitor	12 00†
*E. Kincaid, Student Janitor	13 00†
*H. Newman, Student Janitor	13 00†
D. W. Faeh, Laborer and Assistant to Agriculture-Horticulture.....	4 00
J. Higuera, Farm Laborer	3 50
G. A. Sherrill, Farm Laborer	3 50
Albert Barrios, Farm Laborer	3 50

*These men are paid from earnings of Dining Hall Cafeteria and farm and not by State appropriation.

†Teachers and student janitors also the dining hall help we have checked as part time as their salary is ten installments only instead of twelve.

Statement No. 2, Emergency Employees, July 1, 1919 to June 30, 1920.

Tractor Operator 6 months 7½ days at \$100 per month.....	\$628 39
Inventory Typist and Audit Clerk, 4 months at \$4 per day.....	416 00
Five Students, Saturdays and holidays, 45 days at \$3 per day.....	675 00
Eleven farm laborers during harvest, 57 days at \$3.50 per day (farm labor)	2,194 50

PRESTON SCHOOL OF INDUSTRY.

Name of Officer or Employee and Title	Monthly Salary
O. H. Close, Superintendent.....	\$370 00
(\$70.00 allowed as maintenance for Mr. and Mrs. Close.)	
A. C. Acker, Athletic Director.....	250 00
J. D. Ehlers, Assistant Superintendent.....	235 00
E. Duane Smith, Supervising Principal.....	235 00
Dr. W. O. Solomon, Resident Physician.....	235 00
H. A. Harper, Secretary.....	210 00
H. P. Watson, Detail Officer.....	160 00
A. J. Berg, Bandmaster.....	155 00
L. A. Coan, Electrician.....	155 00
C. H. Campbell, Mason.....	155 00
W. S. Cooper, Plasterer.....	155 00
R. W. Carter, Carpenter.....	155 00
John E. Doney, Printer.....	155 00
William Duffen, Chef.....	155 00
J. W. Gillum, Commissary and Company Captain.....	155 00
F. C. Genzen, Gardener.....	155 00
J. E. Howell, Blacksmith.....	155 00
George F. Heindel, Engineer.....	155 00
H. W. Lane, Tailor.....	155 00
C. W. Lathlean, Auto Mechanic.....	155 00
Charles L. Long, Butcher.....	155 00
Walter Muntz, Plumber.....	155 00
George E. Mann, Laundryman.....	155 00
D. Murphy, Baker.....	155 00
H. G. McGrew, Millman.....	155 00
J. H. Saunders, Dairyman.....	155 00
M. B. Tregaskis, Painter.....	155 00
C. R. Ashton, Shoemaker.....	150 00
John Wakefield, Chief Clerk.....	150 00
H. J. Ashton, Assistant Detail Officer.....	145 00
H. Harris, Inspector.....	145 00
H. H. Aldridge, Night Captain.....	135 00
John J. Barry, Company Officer.....	135 00
J. E. Cass, Company Officer.....	135 00
Thomas Dooley, Company Officer.....	135 00
Arthur Denegar, Company Officer.....	135 00
Jerome Dillon, Company Officer.....	135 00
Charles E. Kinney, Company Officer.....	135 00
H. C. Lee, Company Officer.....	135 00
J. Edward Mulcahy, Company Officer.....	135 00
William Murphy, Company Officer.....	135 00
T. F. Murphy, Company Officer.....	135 00
Parker Robinson, Company Officer.....	135 00
James G. Riley, Company Officer.....	135 00
Charles F. Stark, Company Officer.....	135 00
Milo P. Smith, Company Officer.....	135 00
J. P. Sorensen, Company Officer.....	135 00
T. J. Whelan, Company Officer.....	135 00
Leland B. Wakefield, Company Officer.....	135 00
George E. Wilson, Company Officer.....	135 00
Clara A. Andrew, Teacher.....	130 00
Arvita Mann, Teacher.....	130 00
Rebecca F. Oates, Teacher.....	130 00
Victoria Rudd, Teacher.....	130 00
Narcissa Sheets, Teacher.....	130 00
Jean Pauline Smith, Teacher.....	130 00
John Faragher, Night Watchman, Co. F.....	130 00
A. Belon, Night Engineer.....	130 00
Isabell Ashton, Bookkeeper.....	120 00
Mollie Duffen, Cook.....	120 00
Mayme B. Powers, Nurse.....	120 00
Peter J. Becker, Night Watchman.....	120 00
Thomas Curry, Night Watchman.....	120 00
John Campion, Night Watchman.....	120 00
Frank Dickinson, Night Watchman.....	120 00
Alfred E. Forson, Night Watchman.....	120 00
Dominick Gallagher, Night Watchman.....	120 00
Roscoe E. Gravel, Night Watchman.....	120 00
L. A. Leroy, Night Watchman.....	120 00
C. W. Robinson, Night Watchman.....	120 00
Thomas Tyndall, Night Watchman.....	120 00
William L. Throssel, Night Watchman.....	120 00
D. L. Walker, Night Watchman.....	120 00
M. Merriweather, Ditch Tender.....	115 00
Edith L. Campbell, Clerk.....	110 00
Augusta Ehlers, Supervising Matron.....	110 00
John Heinze, Poultryman.....	110 00
Eleanor Van Praag, Stenographer.....	110 00
Irene Carter, Housemother.....	95 00
Catherine Denegar, Housemother.....	95 00
Flora Howell, Housemother.....	95 00
Florence McGrew, Housemother.....	95 00
Maud Watson, Dining Room Matron.....	95 00
Lillian P. Lathlean, Clerk.....	95 00

PRESTON SCHOOL OF INDUSTRY—Continued.

Name of Officer or Employee and Title	Monthly Salary
Louise L. Wilson, Clerk	95 00
Margaret Murphy, Sewing Room Instructor	95 00
Mary S. Gillum, Censor	85 00
Clara Rothe, Cook	85 00
Linda A. Barry, Housekeeper	75 00
Maud Ballard, Housekeeper	75 00
Lillian D. Coan, Housekeeper	75 00
May Heindel, Housekeeper	75 00
Callie Kenny, Housekeeper	75 00
Florence Lee, Housekeeper	75 00
Christine A. Muntz, Housekeeper	75 00
Enna Robinson, Housekeeper	75 00
Iva Smith, Housekeeper	75 00
S. E. Crow, † Chaplain	30 00
M. J. O'Connor, † Catholic Chaplain	30 00
Laura M. Berg, † Pianist	20 00

\$35.00 per month added to each salary for board and room.

DEPARTMENT OF STATE PRINTING.

(Report of Officers and Regular Employees Employed by This Department on January 1, 1921.)

Working hours: 8 to 5, or 8 hours daily.

Name of Officer or Employee and Title	Monthly Salary
J. M. Cremin, Superintendent	\$416 65*
J. M. Welsh, General Foreman	275 00 U
J. W. Bowman, Foreman Composition Department	262 50 U
H. K. Orman, Night Composition Department	262 50 U
D. D. Sullivan, Deputy and Foreman	250 00*
Robt. Alexander, Chief Clerk	230 00
J. C. Gilkerson, Cost Accountant	230 00
W. M. L. Rigsbee, Cost Checker	225 00
C. H. Johnson, Copy Editor	210 00 U
L. R. Wertz, Machinist	200 00 X
J. J. C. Fitzgerald, Stockkeeper	200 00 X
George Hamlin, Carpenter	165 00
M. Edith Kerr, Timekeeper	150 00
Helen Aviragnete, Secretary	140 00
Dewey McCormick, Truck Driver	135 00
Nellie M. True, Bookkeeper	125 00
Valjean Anderson, Watchman	120 00
L. Rice, Watchman	120 00
Abbie M. Lucey, Typist	100 00
Hilda Hayes, Temporary Typist	80 00
Jack Thielen, Messenger	70 00
Chas. S. Jackson, Janitor (1 hour daily)	25 00†

The following are the per diem employees of this department: the linotype operators are subject to an increase of 50 cents per day over the scale for production of tabular work on machines and the bindery women are entitled to 25 cents per day for work on certain machines. They are all subject to increases of 50 cents over the day rate on the first shift at night and of \$1 over day rate for second shift at night. The compositors, proofreaders, pressmen, bookbinders and bindery women are working at the scale prescribed by their respective unions, except the State law provides a vacation of 15 days with pay in excess of scale.

Name of Officer or Employee and Title	Daily Wage
John W. Gruber, Temporary Steam Fitter	\$10 00
Wm. Arnold, Assistant Foreman Bindery	8 65
Jas. L. Lynn, Assistant Foreman Pressroom	8 60
Alexander Crossan, Temporary Foreman Job Composition	8 60
H. F. Sofge, Machinist, Linotype	8 16
John McCollister, Assistant Foreman Proofroom	8 10
W. F. Anderson, Linotype Operator	7 66
R. R. Anderson, Linotype Operator	7 66
F. W. Baker, Linotype Operator	7 63
Wm. J. Batten, Linotype Operator	7 63
G. D. Beardslee, Linotype Operator	7 63
James M. Byrne, Linotype Operator	7 63
H. E. Constant, Linotype Operator	7 63
Bert Cook, Linotype Operator	7 63
H. C. DeAbna, Linotype Operator	7 63
Lee G. Daggett, Linotype Operator	7 63
Lester Groth, Linotype Operator	7 63
Olive Huttleston, Linotype Operator	7 63
H. C. Jillson, Linotype Operator	7 63
Thomas Melvin, Linotype Operator	7 63
W. R. O'Brien, Linotype Operator	7 63
G. A. Pagnello, Linotype Operator	7 63

U Requires member of printing trades union.

X Requires union scale.

*Statutory position.

†Part-time service.

‡Temporary.

DEPARTMENT OF STATE PRINTING—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
F. A. Peterson, Linotype Operator	7 63
W. E. Pitschke, Linotype Operator	7 67
E. F. Pontin, Linotype Operator	7 63
M. Z. Remsburg, Linotype Operator	7 66
E. M. Stone, Linotype Operator	7 66
Edward O. Strong, Linotype Operator	7 63
Harry V. Tait, Linotype Operator	7 63
G. A. Thomas, Linotype Operator	7 64
Beth Tupper, Linotype Operator	7 63
R. G. Vernor, Linotype Operator	7 63
R. W. Waterson, Linotype Operator	7 63
Leo Williams, Linotype Operator	7 66
Frank Ziegler, Linotype Operator	7 63
Richard Heney, Linotype Battery Man	7 66
O. W. Anderson, Compositor	7 63
Robt. W. Anderson, Compositor	7 63
Donald Bruce, Compositor	7 63
G. M. Crawford, Compositor	7 63
E. M. Duchow, Compositor	7 63
E. F. Drackert, Compositor	7 63
H. L. Dunning, Compositor	7 66
L. F. Fuchs, Compositor	7 63
T. J. Hodgson, Compositor	7 66
H. G. Jackson, Compositor	7 63
A. B. Jessup, Compositor	7 63
H. G. Neubert, Compositor	7 63
J. P. Olwell, Compositor	7 63
Warren E. Read, Compositor	7 63
J. E. Ruggles, Compositor	7 67
Chas. S. Smith, Compositor	7 66
Fred W. Smith, Compositor	7 63
Hugh Stevenson, Compositor	7 63
Wm. J. Swords, Compositor	7 66
James E. Thompson, Compositor	7 63
Frank W. Tupper, Compositor	7 63
J. L. Wildy, Compositor	7 63
L. P. Benedict, Proofreader	7 63
Mrs. Mary Bolton, Proofreader	7 66
Wm. J. Carson, Proofreader	7 63
F. W. Cooke, Proofreader	7 66
Alma Galbraith, Proofreader	7 63
Robt. Hornbeck, Proofreader	7 63
Chas. L. Hornbeck, Proofreader	7 66
Laura Hoyt, Proofreader	7 66
James F. Lyon, Proofreader	7 63
W. A. Snyder, Proofreader	7 63
Chas. Beach, Cylinder Pressman	7 63
John Bocklich, Cylinder Pressman	7 66
J. P. Carlin, Cylinder Pressman	7 63
F. E. Danforth, Cylinder Pressman	7 66
H. C. Galloup, Cylinder Pressman	7 66
J. E. Griswold, Cylinder Pressman	7 66
John McCarthy, Cylinder Pressman	7 63
George Peterson, Cylinder Pressman	7 63
B. Schnaf, Cylinder Pressman	7 63
A. S. Webster, Cylinder Pressman	7 66
L. Albert, Bookbinder	7 63
J. H. Coyle, Folding Machine Operator	7 66
J. F. Creighton, Bookbinder	7 63
Robt. L. Ennis, Bookbinder	7 66
Walter J. Fann, Bookbinder	7 63
Louis Freitas, Bookbinder	7 63
James T. Hickey, Bookbinder	7 66
P. S. Huff, Bookbinder	7 63
H. C. Johnson, Bookbinder	7 66
C. E. Mahoney, Ruler	7 66
C. J. Makillio, Bookbinder	7 63
W. J. McCarthy, Bookbinder	7 66
A. T. McDonald, Bookbinder	7 66
R. D. Muir, Bookbinder	7 63
D. T. Powers, Bookbinder	7 64
Manuel Prola, Bookbinder	7 63
Paul Roth, Bookbinder	7 63
J. J. Ryan, Bookbinder	7 66
B. J. Richter, Bookbinder	7 66
W. H. Stafford, Bookbinder	7 66
J. J. Winslow, Bookbinder	7 66
J. H. Younger, Finisher	7 66
A. E. Zahn, Bookbinder	7 16
A. R. Crook, Platen Pressman	7 16
H. F. Dunn, Platen Pressman	7 16
R. L. Fowkes, Platen Pressman	7 16

DEPARTMENT OF STATE PRINTING—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Daily Wage
J. C. Harlow, Platen Pressman	7 16
R. H. Lachmann, Platen Pressman	7 16
Wm. J. McQuillan, Platen Pressman	7 16
H. N. Sloan, Platen Pressman	7 16
A. J. Torres, Platen Pressman	7 16
J. Hood, Temporary Carpenter	7 00
Clinton Cooper, Apprentice Compositor	6 50
J. T. McNamara, Head Shipping Clerk	6 25
J. J. Whaling, Linotype Metal Man	6 25
Ellis W. Burns, Bill Clerk	6 00
Nell C. Hayes, Forelady	6 00
H. R. Freidenfelt, Assistant Pressman	5 25
C. E. Chatfield, Bill Clerk	5 00
Harry Vacher, Assistant Stockkeeper	5 00
Geo. Elliott, Assistant Pressman	5 00
David Antunez, Bindery Helper	5 00
Allen Cunningham, Apprentice Bookbinder	5 00
D. I. Maddox, Janitor	5 00
Harry L. Mee, Bindery Helper	4 75
Floyd Morris, Bindery Helper	4 75
Frank J. Nye, Shipping Clerk	4 75
Mrs. Daisy Courvoisier, Copyholder	4 33
Mrs. Mary A. Craig, Copyholder	4 33
Dixie Barry Lockett, Copyholder	4 33
Doris A. Lynn, Copyholder	4 33
Eleanor Olbich, Copyholder	4 33
Mollie Platt, Copyholder	4 33
Mrs. J. S. Shoemaker, Copyholder	4 33
Robt. S. Alexander, Ford Truck Driver	4 25
W. H. Donnelly, Temporary Bindery Helper	4 25
A. C. Giddund, Sunday Watchman	4 25
E. C. Grubbs, Janitor	4 25
Frank J. Hepp, Janitor	4 25
John Harley, Bindery Helper	4 25
Colla E. Pierce, Temporary Shipping Clerk	4 25
Marvine Russell, Helper	4 25
H. S. Sanderson, Helper	4 25
Frank Vennewitz, Pressroom Assistant	4 25
R. R. Woltz, Utility Man	4 25
R. C. Younger, Temporary Book Packer	4 00
Clayton Crook, Apprentice Compositor	4 00
Fenton Beard, Apprentice Bookbinder	3 52
Lena Antunez, Bindery Woman	3 52
Ella Branch, Bindery Woman	3 52
Eileen Brome, Bindery Woman	3 52
Norma Brown, Bindery Woman	3 52
Ann Bulger, Bindery Woman	3 52
Laura Burns, Bindery Woman	3 52
Minnie Callen, Bindery Woman	3 52
Luey Coyle, Bindery Woman	3 52
Lillian Croasman, Bindery Woman	3 52
Grace Denham, Bindery Woman	3 52
Alice Fassett, Bindery Woman	3 52
Anna M. Fritz, Bindery Woman	3 52
Marion Gleeson, Bindery Woman	3 52
Belle Graham, Bindery Woman	3 52
Mrs. Mary Harris, Bindery Woman	3 52
Annie James, Bindery Woman	3 52
Mrs. M. Kiernan, Bindery Woman	3 52
Nettie Kirn, Bindery Woman	3 52
Lena Klein, Bindery Woman	3 52
Elizabeth Little, Bindery Woman	3 52
Rose Payne, Bindery Woman	3 52
Elizabeth Real, Bindery Woman	3 52
Mary Ross, Bindery Woman	3 52
Evelyn Ryan, Bindery Woman	3 52
Belle Bartlett, Bindery Woman	3 52
Mrs. E. G. Sullivan, Bindery Woman	3 52
Alice Treharne, Bindery Woman	3 52
Margaret Trainor, Bindery Woman	3 52
Albert J. Klein, Apprentice Compositor	3 50
William E. Gray, Apprentice Copyholder	3 50
Mrs. B. Howard, Apprentice Copyholder	3 50
Lillian Kington, Apprentice Copyholder	3 50
Mrs. Norine Perry, Apprentice Copyholder	3 50
E. Gatzli, Bindery Woman	3 25
Mrs. E. C. Knapp, Bindery Woman	3 00
Ivy Liddicoat, Bindery Woman	3 00
Nathalie O'Neil, Bindery Woman	3 00
Virginia Yadera, Bindery Woman Apprentice	2 75
Nadine Rice, Bindery Woman Apprentice	2 50
Rene McKenney, Bindery Woman Apprentice	2 00
Ruth Murray, Bindery Woman Apprentice	2 00
Alfred Story, Compositor Apprentice	2 00

STATE PRISON AT FOLSOM.

(Report of officers and regular employees employed by this institution on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary	Allowance in Lieu of Board	Board and Quarters per Year Estimate	Total
J. J. Smith, Warden.....	\$416 67	\$200 00	-----	\$616 67
A. H. Wright, Clerk.....	225 00	25 00	-----	250 00
P. J. Cochrane, Captain.....	225 00	25 00	-----	250 00
H. A. Clattenburg, Physician.....	200 00	25 00	-----	225 00
G. L. Cross, Commissary.....	175 00	25 00	-----	200 00
Henry Crowle, Accountant.....	150 00	25 00	-----	175 00
G. C. Jennings, Lieutenant.....	140 00	25 00	-----	165 00
J. F. Klunder, Turnkey.....	130 00	25 00	-----	155 00
J. F. Connell, Lieutenant.....	125 00	25 00	-----	150 00
B. S. Morrison, Secretary.....	110 00	-----	\$35 00	145 00
F. Buys, Machinist.....	110 00	25 00	-----	135 00
F. W. Blanchard, Steward.....	100 00	25 00	-----	125 00
H. J. Carter, Steward.....	100 00	25 00	-----	125 00
F. E. Myers, Foreman Shoe and Tailor Shop.....	100 00	25 00	-----	125 00
F. T. Squifflet, Laundryman.....	100 00	25 00	-----	125 00
W. E. Neil, Assistant Turnkey.....	100 00	25 00	-----	125 00
E. B. Rugh, Chief Nightwatchman.....	100 00	-----	35 00	135 00
H. M. Lohse, Lieut. Nightwatchman.....	100 00	25 00	-----	125 00
C. J. Ryan, Inside Gate.....	100 00	25 00	-----	125 00
C. B. Gillies, Armorer.....	100 00	25 00	-----	125 00
M. E. Nesbitt, Dentist.....	100 00	25 00	-----	125 00
E. D. McCabe, Educational.....	100 00	-----	35 00	135 00
Ed. Bathurst, Carpenter.....	100 00	25 00	-----	125 00
F. A. Schilling, Electrician.....	100 00	25 00	-----	125 00
J. W. Drullinger, Foreman Quarry.....	100 00	25 00	-----	125 00
J. H. Johnston, Blacksmith.....	100 00	25 00	-----	125 00
E. J. Thompson, Farmer.....	95 00	-----	35 00	130 00
A. Berland, Stone Cutter.....	95 00	25 00	-----	120 00
J. T. Hale, Back Gate.....	90 00	25 00	-----	115 00
J. F. Lucas, Locomotive.....	90 00	25 00	-----	115 00
John Anglim, Guard.....	85 00	25 00	-----	110 00
G. N. Arbuckle, Guard.....	85 00	25 00	-----	110 00
J. S. Arbuckle, Guard.....	85 00	-----	35 00	120 00
J. F. Arnerich, Guard.....	85 00	-----	35 00	120 00
A. A. Avila, Guard.....	85 00	-----	35 00	120 00
Fred Ayers, Guard.....	85 00	-----	35 00	120 00
Wm. Earwell, Guard.....	85 00	-----	35 00	120 00
G. C. Brown, Guard.....	85 00	25 00	-----	110 00
D. C. Buddecke, Guard.....	85 00	25 00	-----	110 00
J. A. Burke, Guard.....	85 00	25 00	-----	110 00
W. J. Crean, Guard.....	85 00	-----	35 00	120 00
A. J. Deely, Guard.....	85 00	-----	35 00	120 00
R. W. Dennis, Guard.....	85 00	25 00	-----	110 00
E. E. Dieren, Guard.....	85 00	25 00	-----	110 00
C. G. Earl, Guard.....	85 00	25 00	-----	110 00
A. Eldridge, Guard.....	85 00	25 00	-----	110 00
C. M. Enloe, Guard.....	85 00	25 00	-----	110 00
Valentine Fath, Guard.....	85 00	25 00	-----	110 00
M. C. Feliz, Guard.....	85 00	25 00	-----	110 00
Arthur Gilbert, Guard.....	85 00	25 00	-----	110 00
E. J. Jeffery, Guard.....	85 00	-----	35 00	120 00
C. H. Jolly, Guard.....	85 00	25 00	-----	110 00
J. H. Kemp, Guard.....	85 00	25 00	-----	110 00
James Lamb, Guard.....	85 00	-----	35 00	120 00
F. N. Lambert, Guard.....	85 00	-----	35 00	120 00
C. A. Larkin, Guard.....	85 00	-----	35 00	120 00
R. M. Larkin, Guard.....	85 00	25 00	-----	110 00
W. Lazzarevich, Guard.....	85 00	-----	35 00	120 00
W. L. Lovelady, Guard.....	85 00	25 00	-----	110 00
J. J. McCulligan, Guard.....	85 00	25 00	-----	110 00
P. J. Madsen, Guard.....	85 00	-----	35 00	120 00
R. Maitland, Guard.....	85 00	25 00	-----	110 00
A. Masich, Guard.....	85 00	-----	35 00	120 00
A. D. Miller, Guard.....	85 00	25 00	-----	110 00
M. W. Mitchell, Guard.....	85 00	25 00	-----	110 00
A. S. Mortimer, Guard.....	85 00	25 00	-----	110 00
W. R. Mundell, Guard.....	85 00	-----	35 00	120 00
C. J. Nagle, Guard.....	85 00	-----	35 00	120 00
E. H. Nevia, Guard.....	85 00	25 00	-----	110 00
J. H. Norton, Guard.....	85 00	25 00	-----	110 00
W. J. O'Hare, Guard.....	85 00	-----	35 00	120 00
C. S. Osborne, Guard.....	85 00	25 00	-----	110 00
L. Purcell, Guard.....	85 00	25 00	-----	110 00
Chas. Rigney, Guard.....	85 00	-----	35 00	120 00
P. E. Rigney, Guard.....	85 00	-----	35 00	120 00
R. F. Riley, Guard.....	85 00	-----	35 00	120 00
W. J. Ryan, Guard.....	85 00	25 00	-----	110 00
C. A. Sammons, Guard.....	85 00	-----	35 00	120 00

STATE PRISON AT FOLSOM—Continued.

(Report of officers and regular employees employed by this institution on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary	Allowance in Lieu of Board	Board and Quarters per Year Estimate	Total
C. W. Sammons, Guard.....	85 00	-----	35 00	120 00
B. H. Sanders, Guard.....	85 00	25 00	-----	110 00
C. J. Smith, Guard.....	85 00	-----	35 00	120 00
G. F. Smith, Guard.....	85 00	25 00	-----	110 00
Ned Smith, Guard.....	85 00	-----	35 00	120 00
J. H. Sparks, Guard.....	85 00	25 00	-----	110 00
H. L. Thalls, Guard.....	85 00	-----	35 00	120 00
R. B. Todhunter, Guard.....	85 00	25 00	-----	110 00
Wm. Townsend, Guard.....	85 00	25 00	-----	110 00
A. L. Tupper, Guard.....	85 00	-----	35 00	120 00
M. L. Ward, Guard.....	85 00	-----	35 00	120 00
C. F. Wise, Guard.....	85 00	-----	35 00	120 00
J. H. Ellis, Clergyman.....	50 00	-----	-----	50 00
J. T. McGovern, Clergyman.....	50 00	-----	-----	50 00
Grace L. Boalt, Specialist.....	50 00	-----	-----	50 00
M. W. Haworth, Oculist.....	25 00	-----	-----	25 00

STATE PRISON AT SAN QUENTIN.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Jas. A. Johnston, Warden.....	\$416 67
Mark E. Noon, Clerk of Board.....	250 00
L. L. Stanley, Resident Physician.....	250 00
S. L. Randolph, Captain of Yard.....	200 00
D. T. Foster, Commissary.....	200 00
H. E. Hunter, Accountant.....	175 00
K. T. Fitzzak, Warden's Secretary.....	175 00
Chas. Gulliver, Captain of Guard.....	150 00
W. S. Gillett, District Officer and Superintendent Shoe and Clothing Factory.....	150 00
W. C. Wheeler, Acting Superintendent Furniture Factory.....	150 00
E. F. Zuber, Superintendent Jute Mill.....	150 00
O. C. Laizure, Chaplain and Education Director.....	150 00
T. J. Mullins, Superintendent of Construction.....	140 00
M. D. Ackley, Turnkey.....	125 00
Jas. Fell, Head Spinner.....	120 00
Myron Clark, Lieutenant of Guard.....	115 00
T. C. Maher, Lieutenant of Yard.....	115 00
H. E. Smith, Electrician.....	115 00
A. P. Monaghan, Lieutenant of Jute Mill.....	110 00
C. A. DeLaney, Druggist and Assistant Physician.....	100 00
W. J. Duffy, Steward and Quartermaster.....	100 00
Josephine Jackson, Matron.....	100 00
H. N. Jones, Port Gate Keeper.....	100 00
J. G. McLean, Sergeant First Night Watch.....	100 00
Frank Metcalf, Laundryman.....	100 00
B. M. Miller, Receiving and Shipping Clerk.....	100 00
F. B. Moulton, Sergeant Outside Watch.....	100 00
Jerome Phillips, Sergeant Second Night Watch.....	100 00
Jacob Staiger, Steward Orderly and Guard.....	100 00
J. W. Whittemore, Armorer.....	100 00
W. T. Wilson, Night Gate Keeper.....	100 00
J. L. Wood, Dentist.....	100 00
Dan Curran, Farmer and Stockman.....	95 00
J. H. Carpenter, Sergeant of Yard.....	95 00
G. W. Francis, Foreman Shoe Factory.....	95 00
John Ham, Boss Road Gang.....	95 00
J. S. Nally, Foreman Clothing Factory.....	95 00
J. D. Woodworth, Assistant Turnkey.....	95 00
E. F. Clark, Assistant Steward and Quartermaster.....	90 00
P. D. Connolly, Lower Gate Keeper.....	90 00
F. V. Allen, Guard.....	85 00
C. A. Almy, Guard.....	85 00
F. E. Armstrong, Guard.....	85 00
E. F. Ashworth, Guard.....	85 00
S. B. Bailey, Guard.....	85 00
M. Bain, Guard.....	85 00
B. Biorback, Guard.....	85 00
G. H. Black, Guard.....	85 00
C. H. Boekrath, Guard.....	85 00
H. B. Bowman, Guard.....	85 00
A. J. Brown, Guard.....	85 00
Henry Brown, Guard.....	85 00
H. J. Burns, Guard.....	85 00
Jos. Cannon, Guard.....	85 00

STATE PRISON AT SAN QUENTIN—Continued.

(Report of officers and regular employees employed by this institution on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
F. Collito, Guard.....	85 00
Geo. Chidester, Guard.....	85 00
A. H. Conley, Guard.....	85 00
T. J. Connor, Guard.....	85 00
M. Corbett, Guard.....	85 00
J. N. Cramer, Guard.....	85 00
J. W. Cramer, Guard.....	85 00
W. J. Cronin, Guard.....	85 00
W. A. Crosby, Guard.....	85 00
D. J. Dougherty, Guard.....	85 00
A. H. Erne, Guard.....	85 00
E. J. Fitzgerald, Guard.....	85 00
Jacob Foge, Guard.....	85 00
H. W. Frederiel, Guard.....	85 00
W. P. Geddes, Guard.....	85 00
Grant Gilles, Guard.....	85 00
W. J. Gott, Guard.....	85 00
G. R. Grayson, Guard.....	85 00
N. S. Hamlin, Guard.....	85 00
G. W. Higgins, Guard.....	85 00
F. M. Hiner, Guard.....	85 00
J. E. Hogan, Guard.....	85 00
C. W. Holman, Guard.....	85 00
J. H. Howell, Guard.....	85 00
H. C. Hoy, Guard.....	85 00
P. J. Hyland, Guard.....	85 00
J. G. Kerfoot.....	85 00
C. A. Kimball, Guard.....	85 00
Eugene Kneeland, Guard.....	85 00
W. H. Korstian, Guard.....	85 00
R. E. Lelands, Guard.....	85 00
W. D. Leahy, Guard.....	85 00
A. H. Loman, Guard.....	85 00
H. B. Light, Guard.....	85 00
Eugene Lynch, Guard.....	85 00
W. J. McCain, Guard.....	85 00
W. J. McCus, Guard.....	85 00
O. V. McCullough, Guard.....	85 00
C. A. McEldowney, Guard.....	85 00
O. J. McNally, Guard.....	85 00
Jes. Mahoney, Guard.....	85 00
Geo. Michling, Guard.....	85 00
John Mills, Guard.....	85 00
W. F. Munsey, Guard.....	85 00
M. J. Murray.....	85 00
H. H. Newby, Guard.....	85 00
Carl O. Olson, Guard.....	85 00
A. A. O'Malley, Guard.....	85 00
A. F. Pacheco, Guard.....	85 00
R. F. Perry, Guard.....	85 00
Jos. Phillpini, Guard.....	85 00
W. B. Power, Guard.....	85 00
W. P. Randolph, Guard.....	85 00
J. W. Reid, Guard.....	85 00
Wm. Scherrer, Guard.....	85 00
J. H. Seeba, Guard.....	85 00
F. H. Smith, Guard.....	85 00
Rivera Smith, Guard.....	85 00
U. A. Smith, Guard.....	85 00
Geo. Sokoloff, Guard.....	85 00
Orr Stratton, Guard.....	85 00
C. W. Stuart, Guard.....	85 00
T. F. Sutton, Guard.....	85 00
H. B. Trader, Guard.....	85 00
A. L. Veuve, Guard.....	85 00
A. J. Wade, Guard.....	85 00
H. P. Welch, Guard.....	85 00
C. P. White, Guard.....	85 00
J. D. White, Guard.....	85 00
P. J. White, Guard.....	85 00
F. Wills, Guard.....	85 00
†P. A. Foley, Visiting Chaplain.....	50 00
†Emma B. Laizure, Assistant Matron.....	50 00

All receive the above salaries and board and room. Those who do not elect to take board and room, are allowed in lieu thereof \$25 monthly in addition to amounts named above.

†Part-time.

STATE BOARD OF PRISON DIRECTORS.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Parole and Detective License Departments.

Name of Officer or Employee and Title	Monthly Salary
Ed H. Whyte, as Parole Officer and State Agent, \$275.00; as License Clerk \$25.00.....	\$300 00
E. W. Madden, Deputy Parole Officer.....	175 00
R. E. Langworthy, Deputy Parole Officer in Los Angeles.....	195 00
J. A. Chalmers, Deputy Parole Officer.....	150 00
James J. Byrnes, Deputy Parole Officer.....	135 00
H. O. French, Confidential Stenographer and Clerk.....	135 00

SUMMARY.

Monthly payroll of parole fund.....	\$1,035 00
Monthly payroll of detective license fee fund.....	25 00
Total monthly payroll.....	\$1,060 00

TEMPORARY OR EMERGENCY EMPLOYEES.

No temporary or emergency employees were engaged during the fiscal year ending June 30, 1920. The persons named above were the only ones employed in the San Francisco and Los Angeles offices during that year.

GENERAL INFORMATION.

Salaries fixed by State Board of Prison Directors. Employees allowed traveling expenses when away from the home office on official business. Offices, Rooms 6 and 7, Ferry Building, San Francisco, and 226 Union League Building, Los Angeles.

STATE PURCHASING DEPARTMENT.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
W. G. McMillin, State Purchasing Agent, Head of Department and Buyer of all Food and Forage Supplies.....	\$333 33*
Arthur J. Burton, Assistant Purchasing Agent, Head of Harbor Commission Branch and Stores.....	275 00
Arthur Baker, Deputy State Purchasing Agent, Buyer of Automobiles, Trucks and Special Machinery.....	250 00*
J. F. Misphey, Assistant Purchasing Agent, Buyer of Paper, Stationery, Office Supplies, Printing Materials, and Furniture.....	250 00
Emil H. Kahrs, Assistant Purchasing Agent, Dry Goods, Clothing, Leather Goods, Drugs, Chemicals.....	250 00
Geo. L. Baxter, Testing Engineer, in Charge of Laboratory and Testing of Materials Outside of Foods.....	225 00*
Paul S. Crafton, Chemist and Assistant in Laboratory.....	200 00
Chas. O. Palm, Buyer of Plumbing and Electrical Goods, Steamfitting Supplies, Tools and Shelf Hardware.....	190 00
John J. Garvey, Buyer of Paints, Oils, Painter's Supplies, Lumber, Cement, Building Materials, Farm Machinery and Equipment.....	190 00
Chas. L. Peters, Chief Clerk, in Charge of Funds and Records.....	175 00
Harry Hawes, Assistant to Arthur Burton, Harbor Commission Branch.....	175 00
Mrs. M. L. Johnson, Secretary to Head of Department and Assistant Purchaser of Food and Forage.....	175 00
Frank J. Lewis, Storekeeper and Foreman of Supply Department in Capitol Building.....	165 00
Wm. L. Meuser, Storekeeper and Shipping Clerk, Store Department, Harbor Commission Branch.....	160 00
John H. Whitaker, Clerk and Assistant on Accounts, Sacramento Office.....	150 00
George Henry, Clerk and Keeper of Accounts, Harbor Commission Branch.....	150 00
Miss Anna Gates, Tabulation and Order Clerk, Sacramento Office.....	135 00
Mrs. L. J. McKay, Secretary-Stenographer to Deputy Purchasing Agent.....	135 00
Miss Gladys Bradshaw, Chief Stenographer and Typist, E. H. Kahrs' Division.....	125 00
Miss Ella Knox, Clerk and Typist, Division of Food and Forage.....	125 00
Mrs. M. C. Davis, Chief Stenographer and Typist for C. O. Palm.....	125 00
Mrs. M. P. Smith, Filing Clerk.....	125 00
Miss Evelyn Ball, Stenographer and Typist for J. F. Misphey's Division.....	125 00
Miss Gertrude Reeber, Stenographer and Typist for J. J. Garvey.....	110 00
Miss Gertrude Joseph, Stenographer and Typist, Harbor Commission Branch.....	110 00
Miss Edna Hoffman, Stenographer and Typist, Harbor Commission Branch.....	100 00
Miss Edna Maynard, Stenographer and Typist, Sacramento Office.....	100 00
Mrs. Lucy Elliott, Stenographer and Typist, Stores Division, Capitol Building.....	100 00
Miss Helen Hiller, Stenographer and Typist, Sacramento Office.....	100 00
Miss Ethel V. Bereh, Stenographer and Typist, Telephone Operator, Sacramento Office.....	95 00
W. H. Ripley, Janitor part time, Packer and Porter half time, Stores Division.....	95 00†
Miss Lorraine A. Sullivan, Stenographer and Typist for Testing Engineer.....	85 00
Henry Nabrowsky, Messenger and Mail Clerk.....	70 00
Lea S. Sheffield, Clerk and Packer, Stores Division.....	4 00

*Statutory position.
†Part-time service.

RAILROAD COMMISSION OF STATE OF CALIFORNIA.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
H. D. Loveland, Commissioner	\$666 65
F. R. Devlin, Commissioner	666 65
H. W. Brundige, Commissioner	666 65
Irving Martin, Commissioner	666 65
Richard Sachse, Chief Engineer	500 00
Hugh Gordon, Attorney	416 66
W. C. Fankhauser, Finance Expert	416 66
L. S. Ready, Assistant Chief Engineer	400 00
W. P. Geary, Rate Expert	375 00
C. H. Loveland, Hydraulic Engineer	375 00
A. T. Pettey, Official Reporter	375 00
W. R. Williams, Secretary	325 00
H. G. Mathewson, Assistant Secretary	300 00
W. T. Satterwhite, Examiner	300 00
Myron Westover, Examiner	300 00
W. J. Handford, Service Inspector	300 00
T. G. Hughes, Accountant	300 00
R. M. Vaughn, Assistant Engineer	300 00
G. S. Jacobs, Assistant Engineer	300 00
H. G. Weeks, Assistant Engineer	300 00
L. B. Davis, Reporter	300 00
J. A. Saxon, Reporter	300 00
F. M. Faude, Assistant Engineer	290 00
B. W. Campbell, Assistant Engineer	275 00
L. R. Kessing, Assistant Engineer	275 00
Paul Thelen, Assistant Engineer	275 00
A. L. Wilson, Telephone Engineer	275 00
J. C. Harraman, Assistant Rate Expert	265 00
R. C. Ashworth, Assistant Engineer	260 00
C. L. Rhodes, Assistant Engineer	260 00
A. A. Anderson, Assistant Engineer	250 00
W. J. Dodge, Assistant Engineer	250 00
H. B. Henderson, Assistant Engineer	250 00
Wm. Stava, Assistant Engineer	250 00
H. A. Noble, Assistant Engineer	250 00
A. N. Johns, Assistant Engineer	250 00
F. E. LaSelle, Assistant Rate Expert	250 00
E. T. McGettigan, Recorder	250 00
G. R. Kibbe, Chief Accountant	250 00
J. Converse, Clerk, Los Angeles Office	250 00
G. S. Hill, Assistant Engineer	240 00
H. L. Masser, Assistant Engineer	240 00
Leroy B. Cramer, Assistant Engineer	225 00
A. V. Guillou, Assistant Engineer	225 00
Ward Hall, Assistant Engineer	225 00
E. P. McAuliffe, Assistant Engineer	225 00
P. J. Noerager, Assistant Engineer	225 00
John Spencer, Assistant Engineer	225 00
Frank Wills, Assistant Engineer	225 00
Chas. Grunsky, Assistant Engineer	220 00
F. B. Andrews, Assistant Engineer	215 00
A. B. Daly, Assistant Engineer	215 00
J. E. P. Williams, Assistant Engineer	215 00
Heinrich Schmidt, Draftsman	210 00
M. E. Ready, Assistant Engineer	210 00
W. F. Lemon, Assistant Inspector	210 00
D. W. Davis, Accountant	210 00
G. I. Battelle, Assistant Engineer	200 00
R. L. Davis, Assistant Engineer	200 00
G. R. Drew, Chief Clerk	200 00
E. A. Bender, Assistant Engineer	200 00
D. H. Harroun, Assistant Engineer	200 00
J. G. Hunter, Assistant Engineer	200 00
R. S. MacKall, Assistant Engineer	200 00
J. E. McCaffrey, Assistant Engineer	200 00
W. M. McKay, Assistant Engineer	200 00
Chas. H. Monett, Assistant Engineer	200 00
F. H. Van Hoesen, Assistant Engineer	200 00
J. S. P. Dean, Assistant Rate Expert	200 00
H. A. Loveland, Clerk	200 00
C. N. Olsen, Reporter	200 00
J. H. Peterson, Accountant	200 00
L. M. Tongue, Reporter	200 00
P. D. Code, Accountant	190 00
Chas. A. Beck, Docket Clerk	185 00
R. H. Bishop, Assistant Inspector	185 00
A. E. Fitzpatrick, Chief Stenographer	185 00
R. S. Melvin, Assistant Engineer	180 00
A. G. Cage, Assistant Engineer	175 00
J. E. Cooper, Assistant Engineer	175 00
Clifford Johnstone, Assistant Engineer	175 00
W. H. Mallett, Clerk	165 00

RAILROAD COMMISSION OF STATE OF CALIFORNIA—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
E. M. Doyle, Clerk	165 00
E. M. Doyle, Clerk	160 00
M. P. Hiatt, Clerk	155 00
Owen Lewis, Clerk	155 00
Mary E. Engvick, Stenographer	150 00
J. E. Daugherty, Clerk	150 00
M. E. Boright, Clerk	150 00
Freyman Coleman, Clerk	150 00
L. Fitzpatrick, File Clerk	150 00
M. I. Reed, Assistant Junior Engineer	150 00
I. B. Seis, Stenographer	150 00
F. Schwartz, Transcriber	140 00
H. Souther, Stenographer	140 00
Pauline Elliott, Stenographer	135 00
H. Hartley, Stenographer, Los Angeles Office	135 00
Edith Hamilton, Stenographer	135 00
L. B. Morris, Stenographer	135 00
Katherine Netterville, Stenographer	135 00
H. R. Robbins, Clerk	135 00
E. M. Bowlan, Stenographer	130 00
Katherine Beck, Telephone Operator	130 00
F. Vint, Stenographer	130 00
Esther Warner, Stenographer	125 00
D. B. Allen, Assistant Engineer	125 00
Edith Mahoney, Stenographer	125 00
Marie A. McSirley, Stenographer	125 00
Alice Logan, Stenographer	125 00
L. E. Ogilvie, Stenographer	125 00
Louise Ward, Stenographer	125 00
Hazel Harris, Stenographer	125 00
Gladys Cole, Stenographer	125 00
Joseph McKenna, Clerk	125 00
Anna Wahl, Transcriber	125 00
Ethel Tomkinson, File Clerk	120 00
J. L. Alexander, Stenographer	120 00
N. E. Youngman, Stenographer	120 00
H. B. Radabaugh, Stenographer	115 00
Helen Troy, Stenographer	115 00
C. Bartlett, Clerk	110 00
Iola B. Moore, File Clerk	110 00
Edward McLane, Clerk	105 00
Madeline Holtkamp, Stenographer	105 00
Helen Barnett, Comptometer Operator	100 00
Nell Barton, Typist and Computer	100 00
E. E. Meyer, Stenographer	100 00
A. R. Miller, Stenographer	100 00
M. M. Heberger, Stenographer	100 00
H. W. Webb, Stenographer	100 00
E. M. Gray, File Clerk	100 00
Imogene Hoeber, File Clerk	100 00
D. J. Farren, Clerk	90 00
Wallace Blight, Office Assistant	80 00
C. Ray Bowie, Office Assistant	80 00
Walter Moltke, Office Assistant	75 00
Randolph Pajalich, Office Assistant	75 00
Peter Nenzel, Office Assistant	75 00

STATE REAL ESTATE DEPARTMENT.

(Report of officers and regular employees employed by this department on January 1, 1921.)

\$410.00 to \$450.00.		Monthly Salary	
Name of Officer or Employee and Title			
Ray L. Riley, Commissioner	\$416 66	\$416 66	
\$226.00 to \$250.00.			
R. B. Dunlap, Sacramento Deputy	250 00		
John J. Deane, San Francisco Deputy	250 00	500 00	
\$176.00 to \$200.00.			
J. T. Anderson, Los Angeles Deputy	200 00	200 00	
\$151.00 to \$175.00.			
Thelma Riley, Sacramento Deputy	175 00		
Alfred Dalton, Field Deputy, Los Angeles	175 00		
Richard Jose, Field Deputy, San Francisco	175 00	525 00	

STATE REAL ESTATE DEPARTMENT—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

\$126.00 to \$150.00.

Name of Officer or Employee and Title	Monthly Salary	
Pearl M. Hodgson, Confidential Secretary-----	150 00	150 00

\$101.00 to \$125.00.

Beatrice M. Jebb, Clerk, Los Angeles-----	125 00	
Neva DeHaven, Directory Clerk, Sacramento-----	125 00	
Eva Darwin, Stenographer, Sacramento-----	125 00	
Julia Sims, Clerk, Sacramento-----	125 00	
Corinne Simmons, Clerk-Stenographer, San Francisco-----	115 00	
Cecile Harrison, Correction Clerk, Sacramento-----	110 00	725 00

\$76.00 to \$100.00.

Eunice Pallady, Correction Clerk, Sacramento-----	100 00	
Anne Monroe, Stenographer, Los Angeles-----	100 00	
M. Horgan, Typist, Sacramento-----	100 00	
Mabel Mahoney, Typist-Stenographer-----	100 00	400 00

Less than \$51.00.

F. Boniface, Janitor-----	25 00	25 00
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REGULAR EMPLOYEE—PART TIME

H. Porter Giles, Field Deputy, Oakland, per day-----	6 00	
Approximately per month-----		75 00

Total Monthly Payroll—Regular Employees-----		\$3016 66
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TEMPORARY OR EMERGENCY EMPLOYMENTS

Fourteen Field Deputies and Clerks-----		*\$4518 55
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STATE RECLAMATION BOARD.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Salaries ranging from \$801 to \$900.

Name of Officer or Employee and Title	Monthly Salary
Melville Dozier, Jr., General Manager and Chief Engineer-----	\$833 33

Salaries ranging from \$301 to \$350.

T. B. Waddell, Office Engineer (C. E. Gr. IV)-----	325 00
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Salaries ranging from \$276 to \$300.

E. A. Bailey, Assistant Engineer-----	300 00
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Salaries ranging from \$276 to \$300.

A. M. Wells, Resident Engineer-----	285 00
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Salaries ranging from \$251 to \$275.

Thos. Mayhew, Secretary and Chief Clerk-----	275 00
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Salaries ranging from \$226 to \$250.

W. E. Stoddard, Assistant Engineer (Engr.-Dftsman Gr. III)-----	250 00
G. F. Mellin, Assistant Engineer (C. E. Gr. III)-----	250 00
Paul A. Tarpey, R. W. Agent-----	250 00
Hugh M. Tarpey, R. W. Agent-----	250 00
J. E. Hall, Soil Engineer-----	235 00

Salaries ranging from \$201 to \$225.

A. H. Hubbard, Transitman-----	225 00
J. T. Maguire, Draftsman (Engr.-Dftsman Gr. III)-----	215 00

Salaries ranging from \$176 to \$200.

Walter Ruppel, Draftsman (Engineer Grade III)-----	200 00
C. L. Wilber, Draftsman-----	200 00
F. L. Blair, Draftsman (C. E. Grade II)-----	190 00
J. G. Miller, Draftsman (Engr.-Draftsman Gr. II)-----	190 00
E. J. Murray, Draftsman (C. E. Gr. II)-----	190 00
B. F. Butterfield, Accountant-----	185 00
I. J. Colwell, Transitman (C. E. Grade II)-----	185 00

*Amount covers period December 9 to June 30, 1920, inclusive.

STATE RECLAMATION BOARD—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Salaries ranging from \$151 to \$175.

Name of Officer or Employee and Title	Monthly Salary
M. T. Hubbard, Draftsman (No C. S. Rating).....	175 00
C. W. Roberts, Draftsman (No C. S. Rating).....	175 00
Arthur E. Smith, Draftsman (No C. S. Rating).....	175 00
E. A. Welch, Draftsman (No C. S. Rating).....	175 00
A. Boggess, Inspector.....	175 00
R. P. Temby, Inspector.....	170 00
A. S. Chrysler, Auto Mechanic.....	165 00
W. Blotter, Dragline Inspector.....	160 00
Chas. Simmen, Inspector.....	160 00
F. R. Williams, Timekeeper and Material Clerk.....	160 00
B. L. Hale, Weir Tender.....	160 00

Salaries ranging from \$126 to \$150.

H. F. Gardner, Draftsman.....	150 00
W. A. Julian, Assistant Weir Tender.....	150 00
Ralph L. Irving, Auto Mechanic.....	150 00
Ruth L. Anderson, Stenographer—Grade III (Reports Board and Other Meetings).....	150 00
J. L. Gluyas, Inspector.....	135 00
J. J. Murphy, Inspector.....	135 00
G. Marshall Lee, Junior Clerk.....	130 00
Ida J. Ueberrhein, Senior Clerk.....	130 00

Salaries ranging from \$101 to \$125.

B. A. Wilkie, Assessment Clerk.....	125 00
Lillian Kaeser, Stenographer (Grade II).....	110 00

Salaries ranging from \$76 to \$100.

Gertrude Morrison, Typist.....	100 00
Clyde Robbins, Auto Helper.....	100 00
Frances Samuel, File Clerk.....	100 00
Adah Sanders, Typist.....	100 00
A. B. Fletcher, President of Board.....	No compensation
A. G. Folger, Vice President of Board.....	\$20 per day*
Frank Freeman, Member of Board and Attorney (Salary as Member only).....	20 per day*
G. A. Atherton, Member of Board (Salary as Member only).....	20 per day*
Peter Cook, Member of Board (Salary as Member only).....	20 per day*
Grover C. Shannon, Member of Board (Salary as Member only).....	20 per day*
M. C. Zumwalt, Member of Board (Salary as Member only).....	20 per day*
T. W. Ransom, Consulting Drainage Engineer for Board.....	50 per day†
F. C. Herrmann, Assessor for Board.....	25 per day†
B. A. Etcheverry, Assessor for Board.....	25 per day†
Max Enderlein, Assessor for Board.....	25 per day†

*Also traveling expenses; total remuneration not to exceed \$1,000 per annum.

†Also traveling expenses whenever employed.

CALIFORNIA REDWOOD PARK.

California Redwood Park Commission: Governor William D. Stephens, President;
 Charles B. Wing, Vice Chairman Stanford University; Rev. Father T. L. Murphy, Santa Clara University; Otto D. Stoesser, Secretary, Watsonville;
 Henry L. Middleton, Boulder Creek.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
J. P. Park, Plumber.....	\$150 00
W. H. Dool, Park Warden.....	125 00*
F. J. Hoffmann, Executive Officer.....	100 00†
Tom Mullen, Teamster.....	Daily wage
F. C. Canham, Laborer.....	\$5 00

Number of persons engaged for temporary or emergency employment during the fiscal year ending June 30, 1920, 120; total pay, \$3,409.45.

*Statutory position. †Part-time service.

NOTE—108 of the men included in the number of temporary or emergency employees were firefighters account of forest fires in September, 1919; total pay to them \$1,577 20

SECRETARY OF STATE.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Frank C. Jordan, Secretary of State.....	\$416 65
Frank H. Cory, Deputy.....	250 00
Robert V. Jorian, Corporation Secretary.....	233 30
H. M. Standerwick, Bookkeeper.....	200 00
Charles J. Hagerty, Statistician.....	200 00
E. W. Gardiner, Superintendent and Cashier, Corporation License Department.....	200 00
Ed. L. Head, Keeper of Archives.....	166 65
Lizzie F. Vardin, Recording Clerk.....	150 00
E. T. Hall, Recording Clerk.....	150 00
Leroy Coan, Recording Clerk.....	150 00
Frank T. Barnes, Register Clerk.....	150 00
W. H. Govan, Clerk, Corporation License Department.....	150 00
B. C. Greer, Clerk, Corporation License Department.....	150 00
P. C. Gaskill, Clerk, Corporation License Department.....	150 00
Chas. S. O'Connor, Clerk, Corporation License Department.....	150 00
Harry V. Harvey, Clerk, Corporation License Department.....	150 00
Bertha C. Robinson, Recording Clerk.....	133 30
Anita A. Brewer, Recording Clerk.....	133 30
Alma Kipp-Mulligan, Recording Clerk.....	133 30
A. R. Drennan, Recording Clerk.....	133 30
Mabelle G. Bush, Certificate Clerk.....	133 30
Bertha B. Fontaine, Certificate Clerk.....	133 30
P. A. Dougherty, Messenger.....	125 00
L. Wagner, Porter.....	90 00
†V. E. Cory, Special Legislative Clerk.....	125 00
†George B. Baldwin, Jr., Special Legislative Clerk.....	125 00

†Employed during legislative session only.

SUPREME COURT OF THE STATE OF CALIFORNIA.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of officer or Employee and Title	Monthly Salary	Authority for Employment
F. M. Angelotti, Chief Justice.....	\$666 65	Constitution, article VI, sections 2-17.
Lucien Shaw, Associate Justice.....	666 65	Constitution, article VI, sections 2-17.
William P. Lawlor, Associate Justice.....	666 65	Constitution, article VI, sections 2-17.
Curtis D. Wilbur, Associate Justice.....	666 65	Constitution, article VI, sections 2-17.
Thomas J. Lennon, Associate Justice.....	666 65	Constitution, article VI, sections 2-17.
Warren Olney, Jr., Associate Justice.....	666 65	Constitution, article VI, sections 2-17.
William A. S'loane, Associate Justice.....	666 65	Constitution, article VI, sections 2-17.
B. Grant Taylor, Clerk.....	416 65	Constitution, article VI, section 21; Political Code, section 755.
H. C. Finkler, Secretary.....	250 00	Code of Civil Procedure, Secs. 265-6.
Joseph B. Dryden, Secretary.....	250 00	Code of Civil Procedure, Secs. 265-6.
W. J. Nicholson, Phonographic Reporter.....	250 00	Political Code, Secs. 769-70 and 739.
Fred S. Lafferty, Phonographic Reporter.....	250 00	Political Code, Secs. 769-70 and 739.
Randolph V. Whiting, Reporter of Decisions.....	208 30	Constitution, article VI, section 21; Political Code, sections 767-771-739.
F. L. Stewart, Assistant Reporter of Decisions.....	200 00	Constitution, article VI, section 21; Political Code, sections 767-771-739.
W. F. Traverso, Assistant Reporter of Decisions.....	100 00	Constitution, article VI, section 21; Political Code, sections 767-771-739.
H. F. Wrigley, Assistant Reporter of Decisions.....	100 00	Constitution, article VI, section 21; Political Code, sections 767-771-739.

NOTE—The Reporter of Decisions and assistants provide their own offices and equipment, but receive necessary stationery from the Supreme Court.

W. R. Mackrille, Chief Deputy Clerk, (S. F.).....	\$225 00	Political Code, sections 751-756.
Isadore Erb, Deputy Clerk (San Francisco).....	175 00	Political Code, sections 751-756.
*A. V. Haskell, Deputy Clerk (San Francisco).....	175 00	Political Code, sections 751-756.
Mrs. Harriet P. Tyler, Deputy Clerk (S. F.).....	175 00	Political Code, sections 751-756.
Ray C. Waring, Deputy Clerk (Sacramento).....	175 00	Political Code, sections 751-756.
M. C. Van Allen, Deputy Clerk (Los Angeles).....	175 00	Political Code, sections 751-756.
Wm. I. Traeger, Deputy Clerk (Los Angeles).....	175 00	Political Code, sections 751-756.
J. M. Meredith, Bailiff.....	150 00	Code of Civil Procedure, Secs. 265-6.
E. B. Hinkle, Bailiff.....	150 00	Code of Civil Procedure, Secs. 265-6.
Enid Childs, Stenographer.....	150 00	Code of Civil Procedure, Sec. 47.
Gertrude Cohen, Stenographer.....	150 00	Code of Civil Procedure, Sec. 47.
Paul Girvin, Stenographer.....	150 00	Code of Civil Procedure, Sec. 47.
John W. Lenahan, Stenographer.....	150 00	Code of Civil Procedure, Sec. 47.
Josef Aubel, Janitor.....	130 00	Code of Civil Procedure, Sec. 47.
†F. L. Johnson, Janitor (Los Angeles).....	55 00	Code of Civil Procedure, Sec. 47.
Thomas F. Dunn, Librarian.....	125 00	
Vera C. Riley, Stenographer to Clerk.....	125 00	Political Code, Section 751.

*A. V. Haskell is employed temporarily in place of A. S. Ramage, on leave of absence.

†A temporary janitor served two weeks during the vacation of Josef Aubel.

No other temporary or emergency employees.

STATE OFFICERS AND EMPLOYEES.

STATE SURVEYOR GENERAL.

Ex officio Register of the State Land Office.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
W. S. Kingsbury, Surveyor General.....	\$416 66
A. W. Sanborn, Deputy.....	250 00
Bruce L. Dray, Assistant.....	187 50
Geo. R. Hilby, Civil Engineer.....	175 00†
C. B. Brier, Clerk.....	150 00
A. B. Pattison, Clerk.....	150 00
A. P. Ireland, Clerk.....	150 00
J. D. Lewis, Clerk.....	150 00
A. J. Loftus, Clerk.....	150 00
A. F. Zangerle, Clerk.....	150 00
Lewis Crawford, Porter.....	45 00

W. S. KINGSBURY, Surveyor General.

SUTTER'S FORT.

(Report of officers and regular employees employed by this department on January 1, 1921.)

\$101 to \$125.	
Name of Officer or Employee and Title	Monthly Salary
C. F. Hartmeyer, Gardener.....	\$110 00*
\$76 to \$100.	
E. H. Cox, Sr., Guardian.....	90 00*
J. M. Fay, Assistant Gardener.....	100 00*

STATE TREASURER.

Employees of the State Treasurer's Office on January 1, 1921.

Regular Employees.	
Name and Title	Monthly Salary
Friend W. Richardson, Treasurer.....	\$416 66
John F. Johnson, Deputy.....	266 00
H. P. Reese, Cashier.....	225 00
E. M. Lynch, Bond Officer.....	208 33
W. A. McElvaine, Deposit Officer.....	208 33
Charles L. Swanton, Bookkeeper.....	183 33
Louise B. Bootes, Secretary-Stenographer.....	125 00
Paul Brown, Watchman.....	110 00
M. F. Rowland, Watchman.....	110 00
Warren Weaver, Watchman.....	110 00
W. B. Thorpe, Watchman.....	110 00
Stonewall Jackson, Porter.....	60 00

Temporary Employees During the Calendar Year 1920.

Mrs. Ruth Melaik, Stenographer.....	\$4 00 per day
Miss Ruth Carper, Stenographer.....	4 00 per day

Mrs. Ruth Melaik served fourteen days and Miss Ruth Carper six days, during franchise tax collections.

UNIVERSITY OF CALIFORNIA.

Report of Officers and Employees, January 1, 1921.

All salaries compiled from payrolls for December, 1920.

- Part I. Employees paid by the month.
- Part II. Employees paid by the week.
- Part III. Full time employees paid by the day.
- Part IV. Part time employees paid by the day.
- Part V. Part time employees paid by the hour.
- Part VI. Persons employed on part-time work by the Extension Division.

*Statutory position.

†The salary of Geo. R. Hilby, the Civil Engineer employed by this office, is paid out of the Contingent Fund of this office.

UNIVERSITY OF CALIFORNIA—Continued.

Symbols.

† Part time: No daggers shown in Part IV or V, where all employees are on duty part time.

‡ Paid from sources outside of University for work in same capacity.

E Also appearing in Extension Division List, Part VI.

U Also appearing on Regular List, Part I.

There are no employees whose salaries are set by statute.

\$901.00 to \$1000.00.

Name and Title	Monthly Salary
David P. Barrows, President of the University-----	\$1,000 00*

*With house.

\$701.00 to \$800.00.

G. H. Whipple, Director and Professor of Research, Medicine and Dean of the Medical School-----	708 33
H. R. Hatfield, Professor of Accounting on the Flood Foundation and Dean of the Faculties-----	750 00
W. E. Musgrave, Director of Hospitals-----	750 00

\$601.00 to \$700.00.

R. G. Sproul, Comptroller of the University, Secretary of the Board of Regents and Land Agent-----	625 00
Thomas F. Hunt, Professor of Agriculture and Dean of the College of Agriculture-----	666 66

\$501.00 to \$600.00.

C. L. Cory, John W. Mackay, Jr. Professor of Electrical Engineering and Dean of the College of Mechanics-----	541 66
C. Derleth, Jr., Professor of Civil Engineering and Dean of the College of Civil Engineering-----	541 66
W. C. Jones, Professor of Jurisprudence and Director of School of Jurisprudence-----	541 66
G. N. Lewis, Professor of Chemistry and Dean of the College of Chemistry-----	541 66
F. H. Probert, Professor of Mining and Dean of the College of Mining-----	541 66
A. O. Leuschner, Professor of Astronomy and Director of Student's Observatory, and Dean of the Graduate Division-----	583 33

\$451.00 to \$500.00.

A. F. Lange, Professor of the Theory and Practice of Education and Director of the School of Education-----	458 32
R. T. Legge, Professor of Hygiene and University Physician-----	458 32
B. M. Woods, Professor of Aerodynamics and Dean of the Summer Sessions in Los Angeles and University Examiner-----	458 32
C. A. Kofoid, Professor of Zoology and Assistant Director of the Scripps Institution-----	458 33
G. D. Louderback, Professor of Geology and Dean of the College of Letters and Science-----	458 33
C. H. Rieber, Professor of Logic, Philosophy-----	458 33
R. Shevill, Professor of Spanish-----	458 33
G. H. True, Professor of Animal Husbandry-----	458 33
J. C. Whitten, Professor of Pomology-----	458 33
W. M. Hart, Professor of English and Dean of the Summer Sessions-----	474 99
W. R. Bloor, Professor of Biochemistry-----	500 00
H. E. Bolton, Professor of American History and Curator of the Bancroft Library-----	500 00
W. Campbell, Director and Astronomer, Lick Observatory-----	500 00
B. H. Crocheron, Professor of Agricultural Extension and Director of Agricultural Extension-----	500 00
H. M. Evans, Professor of Anatomy-----	500 00
F. P. Gay, Professor of Pathology-----	500 00
C. M. Gayley, Professor of the English Language and Literature-----	500 00
J. W. Gilmore, Professor of Agronomy-----	500 00
J. G. Howard, Professor of Architecture and Director of the School of Architecture-----	500 00
C. G. Hyde, Professor of Sanitary Engineering-----	500 00
A. C. Lawson, Professor of Mineralogy-----	500 00
O. K. McMurray, Professor of Law-----	500 00
E. Mead, Professor of Rural Institutions-----	500 00
G. S. Milberry, Professor of Chemistry and Metallurgy and Dean of the College of Dentistry-----	500 00
Ernest C. Moore, Director Southern Branch-----	500 00
W. Mulford, Professor and Director of Resident Instruction, and Acting Dean of the College of Agriculture-----	500 00
C. C. Plehn, Professor of Finance on the Flood Foundation-----	500 00
G. M. Stratton, Professor of Psychology and Philosophy-----	500 00
H. E. Van Norman, Professor of Dairy Management, Dean of the University Farm School and Vice Director of Agricultural Experiment Station-----	500 00

E500 00

UNIVERSITY OF CALIFORNIA—Continued.

\$401.00 to \$450.00.

Name and Title	Monthly Salary
W. C. Bray, Professor of Chemistry.....	416 66
M. A. Cartwright, Executive Secretary to the President of the University.....	416 66
E. Elliott, Professor of International Law and Politics.....	416 66
R. A. Gesell, Professor of Physiology.....	416 66
M. W. Haskell, Professor of Mathematics.....	416 66
J. H. Hildebrand, Professor of Chemistry.....	416 66
E. P. Lewis, Professor of Physics.....	416 66
W. P. Lucas, Professor of Pediatrics.....	416 66
F. W. Lunch, Professor of Obstetrics and Gynecology.....	416 66
W. A. Merrill, Professor of Latin Languages and Literature.....	416 66
E. O'Neill, Professor of Inorganic Chemistry and Director of Chemical Laboratory.....	416 66
T. M. Putnam, Professor of Mathematics and Dean of the Undergraduate Division.....	416 66
L. J. Richardson, Professor of Latin and Director of University Extension.....	416 66
W. E. Ritter, Professor of Zoology and Scientific Director of Scripps Institution for Biological Research.....	416 66
W. A. Setchell, Professor of Botany.....	416 66
James Sutton, Recorder of the Faculties.....	416 66
E. T. Williams, Agassiz Professor of Oriental Languages and Literature.....	416 66
G. Y. Rusk, Associate Professor of Pathology, Medical School and Hospital, Associate Professor of Pathology, Dentistry, and Pathologist, University Hospital.....	441 66

\$351.00 to \$400.00.

J. B. Cross, Professor of Economics on the Flood Foundation.....	E354 16
F. S. Foote, Jr., Professor of Railroad Engineering.....	354 16
J. N. LeConte, Professor of Engineering Mechanics.....	354 16
Jessica B. Peixotto, Professor of Social Economics.....	354 16
G. P. Adams, Professor of Philosophy.....	375 00
R. L. Adams, Professor of Farm Management.....	375 00
J. T. Barrett, Professor of Plant Pathology, Acting Director of Citrus Experiment Station, and Acting Dean of the Graduate School of Tropical Agriculture.....	375 00
L. D. Batchelor, Professor of Orchard Management in the Citrus Experiment Station and Graduate School of Tropical Agriculture.....	375 00
F. T. Bioletti, Professor of Viticulture.....	375 00
J. S. Burd, Professor of Agricultural Chemistry.....	375 00
F. Cajori, Professor of the History of Mathematics.....	375 00
W. W. Gregg, Professor of Floriculture and Landscape Gardening.....	375 00
C. M. Haring, Professor of Veterinary Science and Director of Agriculture Experiment Station.....	375 00
S. J. Holmes, Professor of Zoology.....	375 00
W. P. Kelley, Professor of Agricultural Chemistry in the Citrus Experiment Station and Graduate School of Tropical Agriculture.....	375 00
A. L. Kroeber, Professor of Anthropology and Curator of Anthropological Museum.....	375 00
R. J. Leonard, Professor of Vocational Education and Director of Division of Vocational Education.....	375 00
H. L. Leupp, Librarian.....	375 00
C. B. Lipman, Professor of Soil Chemistry and Bacteriology.....	375 00
H. J. Quayle, Professor of Entomology in Citrus Experiment School of Tropical Agriculture.....	375 00
W. C. Rappeleye, Assistant Director of Hospitals.....	375 00
H. S. Reed, Professor of Plant Physiology in the Citrus Experiment Station and Graduate School of Tropical Agriculture.....	375 00
L. S. Schmitt, Secretary of University Hospital, Secretary of the Faculty of the Medical School.....	375 00
C. F. Shaw, Professor of Soil Technology.....	375 00
H. K. Schilling, Professor of German Language and Literature.....	375 00
S. Daggett, Professor of Railroad Economics on the Flood Foundation and Dean of the College of Commerce.....	395 82
R. Piccoli, Lecturer in Literature and Institutions—Italian.....	400 00

\$301.00 to \$350.00.

A. B. Domonoske, Assistant Professor of Mechanical Engineering, and Instructor of U. S. Shipping Board.....	308 33
W. B. Herms, Associate Professor of Parasitology.....	308 33
E. H. Hughes, Assistant Professor of Animal Husbandry and Secretary of Division.....	312 50
J. W. Flinn, University Printer and Superintendent of the Printing Office.....	316 66
F. L. Griffin, Associate Professor of Agricultural Education.....	316 66
F. T. Blanchard, Associate Professor of English, Southern Branch.....	325 00
S. S. Maxwell, Associate Professor of Physiology.....	325 00
R. G. Aitken, Astronomy, Lick Observatory.....	E333 33
J. T. Allen, Professor of Greek.....	333 33
E. B. Babcock, Professor of Genetics.....	333 33
H. H. Benedict, Accountant, Comptroller's Office.....	333 33
B. H. Boren, Principal, University High School.....	333 33
Jesse D. Burks, Special Investigator on Education.....	333 33

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
W. T. Clarke, Professor of Agricultural Extension	333 33
W. C. Crandall, Business Agent, Scripps Institution for Biological Research	333 33
R. T. Crawford, Professor of Astronomy	333 33
J. F. Daniel, Professor of Zoology	333 33
E. Dawson, Professor of American Government	333 33
B. A. Etcheverry, Professor of Irrigation Engineering	333 33
H. S. Fawcett, Professor of Plant Pathology in the Citrus Experiment Station and Graduate School of Tropical Agriculture	333 33
M. C. Flaherty, Professor of Forensics, Department of Public Speaking	333 33
R. T. Holbrook, Professor of French	333 33
N. Hovey, Purchasing Agent, Comptroller's Office	333 33
E. A. Hugill, Superintendent of Grounds and Buildings	333 33
S. J. Hume, Assistant Professor of Dramatic Literature and Art, and Director of the Greek Theatre	333 33
W. L. Jepson, Professor of Botany	333 33
A. M. Kidd, Professor of Law	333 33
D. N. Lehmer, Professor of Mathematics	333 33
I. M. Linforth, Professor of Greek	333 33
E. H. Mauk, Professor of Prosthetic Dentistry	333 33
J. M. Mannon, Jr., Attorney for the Board of Regents	333 33
H. W. Mansfield, Assistant Professor of Mechanical Arts, Southern Branch	333 33
C. H. Marvin, Assistant Director Southern Branch and Assistant Professor of Commerce	333 33
E. I. McCormac, Professor of American History	333 33
K. F. Meyer, Associate Professor of Tropical Medicine	333 33
R. F. Miller, Associate Professor of Animal Husbandry	333 33
W. C. Morgan, Professor of Chemistry, Southern Branch	333 33
G. R. Noyes, Professor of Slavic Languages	333 33
L. J. Paetow, Professor of Mediaeval History	333 33
E. F. Raber, Professor of Mechanical Engineering	333 33
E. H. Reed, Professor of Municipal Government	333 33
C. L. Roadhouse, Professor of Dairy Industry	333 33
C. E. Rugb, Professor of Education	333 33
E. M. Sait, Professor of Political Science	333 33
Lucy W. Stebbins, Dean of Women and Associate Professor of Social Economy	333 33
O. L. Walker, Associate Professor of Tropical Medicine	333 33
E. M. Washburn, Associate Professor of Classical Archaeology, and Manager of the University Press	333 33
C. W. Wells, Professor of English	333 33
W. Woodworth, Professor of Entomology	333 33
D. W. Dickie, Lecturer in Marine Engineering and Naval Architecture and Instructor, U. S. Shipping Board	350 00
Joseph Grinnell, Professor of Zoology and Director of the California Museum of Vertebrate Zoology	350 00
W. L. Howard, Professor of Pomology	350 00
\$276.00 to \$300.00.	
W. V. Cruess, Assistant Professor of Fruit Products	283 33
Alex. McDonald, Beef Herdsman, S. A. University Farm	285 00
V. E. Emmel, Associate Professor of Anatomy	291 33
T. Francis Hunt, Associate Professor of Agricultural Extension	291 66
W. J. Raymond, Associate Professor of Physics	291 66
W. C. Blasdale, Professor of Chemistry	300 00
D. Bruce, Associate Professor of Forestry	300 00
C. E. Chapman, Associate Professor of Latin American and Californian History	300 00
J. E. Dougherty, Associate Professor of Poultry Husbandry	300 00
E. E. Hall, Professor of Physics	E300 00
F. M. Hayes, Associate Professor of Veterinary Science	300 00
D. R. Hoagland, Associate Professor of Agricultural Chemistry	300 00
R. S. Holway, Professor of Physical Geography	300 00
W. T. Horne, Associate Professor of Plant Pathology	300 00
P. B. Kennedy, Associate Professor of Agronomy	300 00
F. L. Kleeberger, Professor of Physical Education and Director of Men's Gymnasium	300 00
E. P. Kurtz, Professor of English	300 00
M. C. Lynch, Professor of Law	300 00
J. A. Marshall, Associate Professor of Biochemistry and Dental Pathology	300 00
C. D. Mead, Associate Professor of Elementary Education	300 00
R. Michaud, Professor of French	300 00
R. S. Minor, Professor of Physics	300 00
S. B. Mitchell, Associate Librarian and Head of Accessions Department	300 00
Agnes F. Morgan, Associate Professor of Household Science	E300 00
C. A. Noble, Professor of Mathematics and Assistant Examiner of Schools	300 00
C. Paschall, Professor of German	300 00
Mary F. Patterson, Associate Professor of Household Art and Design	300 00
M. Radin, Professor of Law	300 00
G. H. Robinson, Professor of Law	300 00
Irving M. Scott, Jr., Instructor, U. S. Shipping Board	300 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
F. V. Simonton, Associate Professor of Operative Dentistry-----	300 00
J. Traum, Associate Professor of Veterinary Science-----	300 00
R. H. Tucker, Astronomer, Lick Observatory-----	300 00
F. W. Woll, Professor of Animal Nutrition-----	300 00
A. T. Wright, Professor of Law-----	300 00
W. H. Wright, Astronomer, Lick Observatory-----	300 00
\$251 to \$275.	
G. W. Curtis, Accountant, University Hospital-----	258 00
Guy Montgomery, Instructor in English and Assistant Dean of the Summer Sessions-----	262 50
Ruby L. Cunningham, Assistant Professor of Hygiene, Physician for Women-----	266 66
L. J. Fletcher, Assistant Professor of Agricultural Engineering-----	266 66
I. C. Hall, Associate Professor of Bacteriology-----	266 66
R. W. Hodgson, Specialist in Agricultural Extension-----	266 66½
W. S. Thomas, Assistant Professor of Education and Examiner of Schools-----	266 66
W. P. Tufts, Assistant Professor of Pomology-----	266 66
H. A. Weinland, Assistant Professor of Agriculture Extension-----	266 66½
E. G. Boone, Professor of Education-----	275 00
S. Blum, Associated Professor of Economics-----	275 00
W. Brown, Associate Professor of Psychology, Dept. of Philosophy-----	275 00
V. C. Bryant, Assistant Professor of Agricultural Extension-----	275 00
C. F. Elwood, Assistant Professor in Agricultural Extension-----	275 00
E. O. Essig, Assistant Professor of Entomology-----	275 00
J. N. Force, Professor of Epidemiology-----	275 00
S. T. Harding, Associate Professor of Irrigation-----	275 00
W. C. Hays, Associate Professor of Architecture-----	275 00
G. W. Hendry, Assistant Professor of Agronomy-----	275 00
E. A. Hersam, Associate Professor of Metallurgy-----	275 00
C. E. Howell, Assistant Professor of Animal Husbandry, Agriculture-----	275 00
M. E. Jaffa, Professor of Nutrition, Agriculture-----	275 00½
H. Kower, Professor of Drawing-----	275 00
L. H. Miller, Associate Professor of Biology, Southern Branch-----	275 00
W. S. Morley, Associate Professor of Metallurgy-----	275 00
H. C. Nutting, Associate Professor of Latin-----	275 00
W. Popper, Associate Professor of Semitic Languages-----	275 00
C. W. Porter, Associate Professor of Chemistry-----	275 00
H. I. Priestley, Associate Professor of Mexican History and Librarian of the Bancroft Library-----	275 00
A. W. Ryder, Associate Professor of Sanskrit-----	275 00
A. Smith, Assistant Professor of Soil Technology, Agriculture-----	275 00
F. B. Sumner, Associate Professor of Biology-----	275 00
T. Tavernetti, Assistant Professor of Farm Practice and Assistant to the Dean of the University Farm School-----	275 00
F. J. Teggart, Associate Professor of Social Institutions-----	275 00
L. M. Turner, Associate Professor of French-----	275 00
L. C. Uren, Associate Professor of Petroleum Engineering-----	275 00
E. C. Van Dyke, Assistant Professor of Entomology-----	275 00
C. D. vonNeumayer, Associate Professor of Public Speaking and Dramatic Art-----	275 00
E. C. Voorhies, Assistant Professor of Animal Husbandry and Assistant to the Dean of the College of Agriculture-----	275 00
W. S. Weeks, Associate Professor of Mining-----	275 00
\$226.00 to \$250.00.	
A. P. McKinley, Assistant Professor of Latin, Southern Branch-----	229 16
G. F. Paddock, Acting Astronomer in charge of D. O. Mills Expedition-----	229 16
George A. Smithson, Assistant Professor of English, University Extension-----	229 16
Nellie H. Gore, Assistant Professor of Fine Arts, Southern Branch-----	233 33
A. H. Hoffman, Assistant Professor Agricultural Engineering-----	233 33
L. B. Smith, Assistant Professor of Agricultural Extension-----	233 33½
P. E. Smith, Assistant Professor of Anatomy-----	233 33
C. M. Titus, Teacher in University Farm School-----	233 33
W. E. Tomson, Associate in Animal Husbandry-----	233 33
W. W. Weir, Assistant Professor of Soil Technology-----	233 33
E. T. Bartholomew, Assistant Professor of Plant Pathology-----	240 00
T. C. Burnett, Assistant Professor of Physiology-----	241 66
F. W. Cozens, Assistant Professor of Physical Education, Southern Branch-----	241 66
M. L. Darsie, Assistant Professor of Education, Southern Branch-----	241 66
W. E. Lloyd, Assistant Professor of Poultry Husbandry-----	241 66
J. Loewenberg, Assistant Professor of Philosophy-----	241 66
F. Adams, Professor of Irrigation Investigation-----	250 00½
J. M. Adams, Associate Professor of Physics, Southern Branch-----	250 00
A. C. Alvarez, Associate Professor of Civil Engineering-----	250 00
H. J. Baade, Assistant Professor of Agricultural Extension-----	250 00½
T. D. Beckwith, Assistant Professor of Pathology-----	250 00
J. P. Benson, Assistant Professor of Agricultural Extension-----	250 00½
G. Boas, Assistant Professor of Forensics, Department of Public Speaking-----	250 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Emma J. Breck, Supervisor of the Teaching of English, University High School	250 00
J. V. Breitweiser, Associate Professor of Education	E250 00
W. R. Camp, Associate Professor of Rural Institutions	250 00
H. L. Bruce, Associate Professor of English	E250 00
E. Buceta, Assistant Professor of Spanish	250 00
G. M. Calhoun, Associate Professor of Greek	250 00
A. G. W. Cerf, Lecturer in French, Southern Branch	250 00
B. L. Clark, Assistant Professor of Paleontology	250 00
R. E. Clausen, Assistant Professor of Genetics	250 00
C. M. Conner, Assistant Professor of Agricultural Extension	250 00
H. Cozens, Vice Principal of Junior Division University High School	250 00
Nadine Crump, Representative in Southern California University Extension	250 00
R. E. Davis, Associate Professor of Civil Engineering	250 00
M. E. Deutsch, Professor of Latin	250 00
J. R. Douglas, Assistant Professor of American Politics and Administration and Director of Bureau of Public Administration	250 00
A. S. Eakle, Professor of Mineralogy	250 00
H. W. Edwards, Supervisor of Physical Sciences University High School	250 00
S. Einarsson, Associate Professor of Practical Astronomy	250 00
S. B. Freeborn, Assistant Professor of Entomology	250 00
N. L. Gardner, Assistant Professor of Botany and Curator in the Herbarium	250 00
G. E. Gibson, Assistant Professor of Chemistry	250 00
T. H. Goodspeed, Associate Professor of Botany	250 00
#J. F. Grass, Jr., Specialist in Agricultural Extension	240 00
F. W. Hart, Associate Professor of Education	250 00
P. L. Hibbard, Assistant Professor of Agricultural Chemistry	250 00
#B. J. Jones, Assistant Professor of Agricultural Extension	250 00
#A. A. Jungermann, Specialist in Agricultural Extension	250 00
O. J. Kern, Assistant Professor in Agricultural Extension	250 00
W. J. Kerr, Instructor in Medicine and Executive Officer	250 00
W. Kirk, Professor of Social Economics	250 00
F. J. Klingberg, Associate Professor of History, Southern Branch	250 00
H. B. Langille, Associate Professor of Machine Design and Mechanical Drawing	250 00
#M. A. W. Lee, Assistant Professor of Agricultural Extension	250 00
B. H. Lehman, Assistant Professor of English	250 00
W. Leslie, Assistant Professor of Insurance	250 00
Juliette Levy, Supervisor of the Teaching of Modern Languages, University High School	250 00
Florence Lutz, Lecturer in Voice Culture, Department of Public Speaking	250 00
J. A. Long, Associate Professor of Embryology, Department of Zoology	250 00
#T. C. Mayhew, Specialist in Agricultural Extension	250 00
Katherine L. McLaughlin, Associate Professor of Primary Education, Southern Branch	250 00
J. F. McMullen, Assistant and Instructor in Mechanics and Instructor U. S. Shipping Board	250 00
W. Metcalf, Assistant Professor of Forestry	250 00
R. O. Moody, Associate Professor of Anatomy	250 00
J. H. Moore, Associate Astronomer, Lick Observatory	250 00
Louise Morrow, Assistant Professor of Applied Nursing and Director of Nursing and Social Service	250 00
#C. S. Myszka, Assistant Professor of Agricultural Extension	250 00
#J. W. Nelson, Associate Professor of Agricultural Extension	250 00
A. H. Nobbs, Chief Instructor in Clinical Dentistry	250 00
E. L. Overholzer, Assistant Professor of Pomology	250 00
Louise Patterson, Supervisor of the Teaching of Physical Education, University High School	250 00
T. Peterson, Assistant Professor of Latin	250 00
C. Price, Associate Professor of Latin	250 00
B. B. Rakestraw, Assistant Director in Charge of Offices, University Extension	250 00
M. Randall, Assistant Professor of Chemistry	250 00
#H. E. Ruggles, Assistant Clinical Professor of Roentgenology	250 00
T. F. Sanford, Associate Professor of English	250 00
C. L. A. Schmidt, Assistant Professor of Biochemistry	250 00
G. E. Sherwood, Associate Professor of Mathematics, Southern Branch	250 00
Edna Stone, Supervisor of the Teaching of Social Sciences, University High School	250 00
Saidee M. Sturtevant, Supervisor of Girls' Activities, University High School	250 00
#P. Talbott, Assistant Professor of Agricultural Extension	250 00
G. D. Turubow, Assistant Professor of Dairy Industry	250 00
R. M. Underhill, Assistant Accountant, Comptroller's Office	250 00
R. P. Utter, Associate Professor of English	250 00
R. S. Vail, Assistant Professor of Orchard Management in the Citrus Experiment Station and Graduate School of Tropical Agriculture	250 00
J. J. Van Nostrand, Assistant Professor of Ancient History	250 00
F. J. Veuhmeyer, Assistant Professor of Irrigation Investigations	250 00
C. W. Waddle, Associate Professor of Education, Southern Branch	250 00
#H. F. Wahberg, Specialist in Agricultural Extension	250 00
#H. L. Washburn, Specialist in Agricultural Extension	250 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
T. T. Waterman, Assistant Professor in Anthropology.....	250 00
D. E. Watkins, Assistant Professor of Public Speaking.....	250 00
C. T. Wiskocil, Associate Professor of Civil Engineering.....	250 00
\$201 to \$225.	
G. J. Crinnion, Assistant Superintendent, University Hospital.....	208 00
H. L. Belton, Teacher, University Farm.....	208 33
F. H. Cherry, Assistant Professor of Electrical Engineering.....	208 33
W. R. Crowell, Assistant Professor of Chemistry, Southern Branch.....	208 33
Mary B. Davidson, Assistant Dean of Women.....	208 33
E. D. Eastman, Assistant Professor of Chemistry.....	208 33
#Harriet G. Eddy, Assistant Professor of Agricultural Extension.....	208 33
S. Carolyn Fisher, Instructor in Psychology, Southern Branch.....	208 33
J. B. France, Specialist in Agricultural Extension.....	208 33
A. K. Gray, Assistant Professor of English, Southern Branch.....	208 33
Ruth Okey, Assistant Professor of Household Science.....	208 33
#E. L. Garthwaite, Specialist in Agricultural Extension.....	208 33
#H. I. Graser, Specialist in Agricultural Extension.....	208 33
#G. L. Greves, Assistant Professor of Electrical Engineering.....	208 33
R. C. Ingram, Teacher at University Farm.....	208 33
J. Jacobson, Foreman of Repairs, University Farm.....	208 33
#L. Y. Leonard, Specialist in Agricultural Extension.....	208 33
Helen E. Matthewson, Counselor of Women, Southern Branch.....	208 33
W. F. Meyer, Assistant Professor of Astrophysics.....	208 33
F. E. Older, Assistant Professor of the Teaching of Agriculture, Southern Branch.....	208 33
Kate F. Osgood, Assistant Supervisor of Practice Teaching, Southern Branch.....	208 33
W. A. Smith, Assistant Professor, Educational Psychology, Southern Branch.....	208 33
#E. F. Smyth, Specialist in Agricultural Extension.....	208 33
B. F. Stelter, Assistant Professor of English, Southern Branch.....	208 33
T. D. Stewart, Assistant Professor in Chemistry.....	208 33
#W. Sullivan, Specialist in Agricultural Extension.....	208 33
C. V. Taylor, Assistant Professor of Zoology.....	208 33
Lillian Ray Titcomb, Physician for Women, Southern Branch.....	208 33
Ethel B. Waring, Associate in Primary Education and Superintendent of Primary Training, Southern Branch.....	208 33
F. W. Allen, Assistant Professor of Pomology.....	216 66
J. R. Beach, Instructor in Veterinary Science.....	216 66
#N. B. Beckett, Associate Professor of Irrigation Practice.....	216 66
M. B. Boissevain, Specialist in Agricultural Extension.....	216 66
B. C. Bougher, Specialist in Agricultural Extension.....	216 66
Olga L. Bridgman, Assistant Clinical Professor of Abnormal Psychology.....	216 66
R. B. Fasson, Specialist in Agricultural Extension.....	216 66
Grace M. Fernald, Assistant Professor of Psychology, Southern Branch.....	216 66
G. F. McEwen, Assistant Professor, Oceanographer, and Curator of the Oceanographic Museum.....	216 66
#J. W. Adriance, Specialist in Agricultural Extension.....	225 00
J. W. Aljets, Assistant to Superintendent, Department of Repairs.....	225 00
L. Bacon, Assistant Professor of English.....	225 00
B. A. Bernstein, Assistant Professor of Mathematics.....	225 00
R. T. Birge, Assistant Professor of Physics.....	225 00
G. E. K. Branch, Assistant Professor of Chemistry.....	225 00
A. G. Brodeur, Assistant Professor of English.....	225 00
J. T. Clark, Assistant Professor of French.....	225 00
L. B. Clark, Radium Department, University Hospital.....	225 00
E. R. DeOng, Instructor in Entomology.....	225 00
P. B. Fay, Assistant Professor of French.....	225 00
#D. S. Fox, Specialist in Agricultural Extension.....	225 00
R. S. French, Assistant Professor of Education.....	225 00
E. Fritz, Assistant Professor of Forestry.....	225 00
H. B. Frost, Research Associate in Plant Breeding and the Citrus Experiment Station and Graduate School of Tropical Agriculture.....	225 00
W. Girard, Assistant Professor of French.....	225 00
Harriet Glazier, Assistant Professor of Mathematics, Southern Branch.....	225 00
R. W. Gordon, Assistant Professor of English.....	225 00
A. R. C. Haas, Assistant Professor of Plant Physiology in the Citrus Experiment Station and Graduate School of Tropical Agriculture.....	225 00
R. M. Holman, Assistant Professor of Botany.....	225 00
F. Irwin, Assistant Professor of Mathematics.....	225 00
L. T. Jones, Assistant Professor of Physics.....	225 00
R. M. Jones, Assistant Professor of Greek.....	225 00
C. C. Judson, Assistant Professor of Graphic Art.....	225 00
Y. S. Kuno, Assistant Professor of Japanese.....	225 00
W. F. Langelier, Assistant Professor of Sanitary Engineering.....	225 00
C. A. LeDeve, Assistant Professor of Accounting, Southern Branch.....	225 00
#J. W. Logan, Specialist in Agriculture Extension.....	225 00
B. A. Madson, Assistant Professor of Agronomy.....	225 00
C. E. Martin, Assistant Professor of Government, Southern Branch.....	225 00
G. T. Matthews, Supervisor of the Teaching of Music, University High School.....	225 00
S. G. Morley, Associate Professor of Spanish.....	225 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
W. A. Morris, Associate Professor of English History.....	225 00
W. Perry, Assistant Professor of Architecture.....	225 00
L. M. Price, Assistant Professor of German.....	225 00
F. P. Keagan, Assistant Professor of Zoology.....	225 00
#M. A. Rice, Specialist in Agricultural Extension.....	225 00
#C. W. Rubel, Associate Professor of Agricultural Extension.....	225 00
W. L. Seawright, Assistant Professor of Physical Education.....	225 00
May Secret, Assistant Professor of Agricultural Extension.....	225 00
H. H. Severin, Instructor in Entomology.....	225 00
H. M. Showman, Assistant Professor of Mathematics, Southern Branch.....	225 00
A. Solomon, Assistant Professor of French.....	225 00
I. F. Smith, Cashier, S. A. University Farm.....	225 00
F. C. Stevens, President's Secretary.....	225 00
E. C. Stricklen, Assistant Professor of Music.....	225 00
A. Thaler, Assistant Professor of English.....	225 00
J. E. Tippet, Specialist in Agricultural Extension.....	225 00
E. C. Tolman, Assistant Professor of Psychology.....	225 00
I. F. Torrey, Teacher, Chemistry, S. A. University Farm.....	225 00
Frances A. Wright, Assistant Professor of Music, Southern Branch.....	225 00
W. J. Wythe, Assistant Professor of Mechanical Drawing.....	225 00

\$176 to \$200.

Elizabeth Lathrop, Associate in Home Economics, Southern Branch, and Smith-Hughes, Southern Branch.....	176 66
Dan S. Putnam, Property Man, University Hospital.....	177 00
George Hughling, Special Assistant, Physical Education, Men.....	180 00
A. G. Bailey, Teacher, Drawing, Southern Branch.....	183 33
J. P. Bennett, Instructor in Pomology.....	183 33
J. S. Bolin, Associate in Education.....	183 33
L. F. D. Briols, Teacher, French, University Extension.....	183 33
H. M. Butterfield, Correspondence Teacher, Agriculture.....	183 33
Margaret M. Campbell, Teacher in Charge of Ninth Grade, Southern Branch.....	183 33
D. H. Carey, Teacher at University Farm.....	183 33
A. R. Davis, Instructor in Soil Chemistry and Bacteriology.....	183 33
Jessie L. F. Decker, Assistant in Agricultural Extension.....	183 33
E. Dershem, Instructor in Physics.....	183 33
P. L. Faye, Associate Curator of the Anthropological Museum and Lecturer in Anthropology.....	183 33
Hope Gladding, Assistant Professor, Household Art and Design.....	183 33
M. W. Graham, Instructor in Spanish.....	183 33
Florence M. Hallam, Instructor in Chemistry, Southern Branch.....	183 33
Alice O. Hunnewell, Instructor in English, Southern Branch.....	183 33
Katherine Kahley, Teacher in Charge of Eighth Grade, Southern Branch.....	183 33
H. R. Keller, Assistant in Agricultural Extension.....	183 33
Melva Latham, Assistant Professor of History, Southern Branch.....	183 33
W. W. Lyman, Jr., Associate in Celtic and English.....	183 33
J. C. Marquardt, Associate in Dairy Industry.....	183 33
J. C. Martin, Instructor in Agricultural Chemistry.....	183 33
F. T. Murphy, Assistant in Agricultural Extension.....	183 33
W. A. Paxton, Teacher in Manual Arts, Southern Branch.....	183 33
G. L. Philip, Instructor in Pomology.....	183 33
Shirley Poore, Superintendent of Teaching of Drawing, University High School.....	183 33
Mary M. Richardson, Assistant in Agricultural Extension.....	183 33
Elizabeth H. Smith, Assistant Professor of Plant Pathology.....	183 33
F. M. Spurrier, Assistant in Agricultural Extension.....	183 33
Olive E. Steinbeck, Assistant in Agricultural Extension.....	183 33
G. J. Surr, Field Assistant in the Citrus Experiment Station.....	183 33
W. J. Tocher, Assistant in Agricultural Extension.....	183 33
B. M. Varney, Instructor in Meteorology.....	183 33
H. A. Wadsworth, Instructor in Irrigation Investigations.....	183 33
G. H. Wilson, Instructor in Animal Husbandry.....	183 33
Mallinda H. Woodworth, Specialist in Agricultural Extension.....	183 33
R. Wulzen, Instructor in Physiology.....	183 33
Ralph L. Dunham, Swine Herdsman, S. A. University Farm.....	185 00
J. J. Kilcommon, Senior Bookkeeper, Comptroller's Office.....	185 00
George Phillips, Shepherd, S. A. University Farm.....	185 00
F. E. Beckman, Assistant Professor of French and Spanish, Southern Branch.....	187 50
F. F. Wood, Dean and Instructor in Plumbing, Wilmerding School.....	187 50
Louise P. Sooy, Instructor in Fine Arts, Smith Hughes, Southern Branch.....	188 33
H. F. Allen, Assistant Professor of English, Southern Branch.....	191 66
#A. M. Burton, Specialist in Agricultural Extension.....	191 66
G. W. Clark, Instructor in Pharmacology.....	191 66
#E. W. Curtis, Specialist in Agricultural Extension.....	191 66
C. L. Flint, Instructor in Landscape Gardening and Floriculture.....	191 66
#Zilla E. Mills, Assistant in Agricultural Extension.....	191 66
Gladys Nevenzel, Assistant in Agricultural Extension.....	191 66
Fieda E. Smith, Assistant in Agricultural Extension.....	191 66
#C. C. Staunton, Specialist in Agricultural Extension.....	191 66
M. H. Wallace, Assistant Professor of Physical Education, Southern Branch.....	191 66

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
#Elizabeth M. Wills, Assistant in Agricultural Extension.....	191 63
B. Kirk Smith, Instructor in Fine Arts, Southern Branch.....	197 53
W. E. Allen, Biologist and Publicity Secretary, Scripps Institution Biological Research.....	200 00
#E. O. Amundson, Specialist in Agricultural Extension.....	200 00
V. Arntzen, Expert Mechanic in Civil Engineering Laboratory.....	200 00
C. H. Bell, Instructor in German.....	200 00
J. A. Brennan, Dairy Herdsman, University Farm.....	200 00
F. Brockway, Instructor in Mechanical Arts, Southern Branch.....	200 00
Edith S. Bryan, Assistant Professor of Public Health Nursing.....	200 00
F. M. Bumstead, Superintendent of Circulation Library.....	200 00
C. J. Burrell, Teacher Mathematics, University Farm.....	2 00 00
A. W. Christie, Instructor in Fruit Products.....	200 00
Lillian D. Clark, Specialist in Agricultural Extension.....	200 00
Mary G. Collopy, Assistant in Agricultural Extension.....	200 00
Edith M. Coulter, Reference Librarian.....	200 00
A. E. Davie, Engineer, Southern Branch.....	200 00
W. H. Dore, Instructor in Agricultural Chemistry.....	200 00
#H. E. Drobish, Specialist in Agricultural Extension.....	200 00
Ruth Elliott, Assistant Professor of Physical Education.....	200 00
J. K. Fisk, Assistant to the Recorder.....	200 00
W. F. Gericke, Assistant Professor of Soil Chemistry.....	200 00
G. E. Gordon, Assistant in Agricultural Extension.....	200 00
F. M. Greene, Supervisor of Practice Work.....	200 00
Pauline Gunthorp, Head Cataloguer, Library.....	200 00
#W. Harrison, Specialist in Agricultural Extension.....	200 00
Ellen Hedrick, Classifier, Library.....	2 00 00
A. H. Hendrickson, Assistant Professor of Pomology.....	200 00
J. J. Hill, Assistant Librarian of Bancroft Library.....	200 00
Mary Kavanagh, Assistant in Anaesthesia.....	200 00
E. A. Kincaid, Instructor in Economics.....	E 200 00
G. H. Kress, Dean Los Angeles Medical Department.....	200 00
W. M. Latimer, Instructor in Chemistry.....	200 00
Rachel L. Ash, Assistant Clinical Professor of Medicine and Pediatrics.....	200 00
J. W. Marsh, Instructor in Mechanical Arts, Southern Branch.....	2 00 00
#J. W. Masten, Specialist in Agricultural Extension.....	200 00
Alice F. Maxwell, Instructor in Obstetrics and Gynecology.....	200 00
R. D. McCallum, Specialist in Agricultural Extension.....	200 00
Myrta L. McClellan, Instructor in Geography, Southern Branch.....	200 00
J. D. Miller, Teacher, University Farm School.....	200 00
#J. W. Mills, Specialist, Agricultural Extension.....	200 00
P. W. Nahl, Assistant Professor of Freehand Drawing and Art Anatomy, and Curator of the Arnes Museum.....	200 00
G. F. Nelson, Mechanician, Chemistry.....	2 00 00
K. E. Neuhaus, Assistant Professor of Art Appreciation.....	200 00
#J. H. Norton, Specialist in Agricultural Extension.....	200 00
W. B. Phillips, Instructor in Mechanical Arts, Southern Branch.....	200 00
C. H. Raymond, Instructor in English.....	200 00
W. R. Rhoads, Instructor in Commercial Practice, Southern Branch.....	200 00
Clarissa Roehr, Pharmacist, University Hospital.....	200 00
F. Schneider, Instructor in German.....	200 00
Elizabeth Schulze, Instructor in Roentgenology.....	2 00 00
C. O. Smith, Research Associate in Plant Pathology, Citrus Experiment Station, and Graduate School of Tropical Agriculture.....	200 00
E. Squires, Engineer, Heat and Light.....	200 00
W. R. Stamper, Mechanician, Physics.....	200 00
#C. E. Sullivan, Specialist in Agricultural Extension.....	200 00
Olive Swezy, Research Associate, Zoology Research.....	200 00
E. E. Thomas, Research Associate, Agricultural Chemistry, Citrus Experiment Station and Graduate School of Tropical Agriculture.....	200 00
B. R. Vanleer, Instructor in Mechanical Engineering.....	200 00
G. I. Vaughn, Engineer, Heat and Light.....	2 00 00
H. J. Wambold, Instructor, Southern Branch.....	200 00
W. H. Williams, Instructor, Physics.....	200 00
J. F. Wilson, Assistant Professor, Animal Husbandry.....	200 00
A. M. Woodman, Teacher, University Farm School.....	200 00
J. H. Woolsey, Instructor in Surgery and Executive Officer.....	200 00
E. H. Wright, Instructor in Physical Education.....	200 00
C. L. White, Business Agent, Southern Branch.....	204 16
\$151 to \$175.	
William J. Taylor, Technician, X-Ray, University High School.....	152 00
A. Edgar, Fireman, Heat and Light.....	152 50
O. M. Hubbs, Fireman, Heat and Light.....	152 50
T. J. Nylander, Fireman, Heat and Light.....	152 50
J. Savage, Fireman, Heat and Light.....	152 50
E. Dusenberry, Assistant Physiotherapy, Hahnemann Hospital.....	153 00
M. Ryan, Surgery Department, Hahnemann Hospital.....	154 00
M. C. Wilson, Directress, Hahnemann Hospital.....	154 00
Alex McGilloray, Head Janitor, Southern Branch.....	154 16

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
H. E. Furchgott, Chief Physiotherapy Department, Hahnemann Hospital.....	158 00
Alice Ralston, Supervisor Nursing Education, University Hospital.....	158 00
S. M. Brown, Assistant Chemist in the Citrus Experiment Station.....	158 33
#E. E. Frasher, Assistant in Agricultural Extension.....	158 33
O. Ghigglioli, Creamery Foreman, University Farm.....	158 33
#G. A. Goatley, Assistant in Agricultural Extension.....	158 33
Barbara Greenwood, Teacher in Charge of Kindergarten, Southern Branch.....	158 33
Helen Keller, Supervisor of Opportunity Room, Southern Branch.....	158 33
Blanche Kells, Teacher of Physical Training, Southern Branch.....	158 33
J. C. Johnston, Assistant in Citriculture.....	158 33
Edith Ringer, Teacher in Charge of Third Grade, Southern Branch.....	158 33
Emma J. Robinson, Teacher in Charge of Sixth Grade, Southern Branch.....	158 33
Katherine Spiro, Teacher in Charge of Fourth Grade, Southern Branch.....	158 33
Lulu M. Stedman, Teacher in Charge of Fifth Grade, Southern Branch.....	158 33
Edith Wallop, Teacher in Charge of Second Grade, Southern Branch.....	158 33
#W. G. Waterhouse, Assistant in Agricultural Extension.....	158 33
Charles W. Andrews, Assistant in Wrestling, Physical Education, Men.....	161 00
Helen Bloodgood, Nurse, University Hospital.....	160 00
Florence Boddy, Nurse, University Hospital.....	160 00
William L. Dye, Assistant, Spanish.....	160 00
A. H. Furnstal, Technician, Berkeley.....	160 00
L. H. Gazzele, Steam Operator, Heat and Light.....	160 00
Josephine Green, Supervisor, Nursing Education, University Hospital.....	160 00
R. E. Johnson, Assistant in Boxing, Physical Education, Men.....	160 00
Sophia H. Levy, Assistant to Dean of Graduate Division and Associate in Theoretical Astronomy.....	160 00
J. Roche, Steam Operator, Heat and Light.....	161 00
L. D. Lockwood, Instructor in Architectural Drawing, Wilmerding School.....	162 50
Frank Watson, Orchard Foreman, University Farm.....	160 00
F. M. Williams, Instructor, General Science, Wilmerding School.....	162 50
Emil Maggia, Gardener, Botany.....	163 00
Clyde Bates, Commissary Buyer, Comptroller's Office.....	165 00
Frances H. Hanna, Record Clerk, Comptroller's Office.....	165 00
Edward Mayer, Secretary, Visual Instruction, University Extension.....	165 00
S. N. Shapero, Inventory Clerk, Comptroller's Office.....	165 00
T. L. Storer, Field Naturalist, Museum.....	165 00
Cyril Strode, Driver, Dairy Sales.....	165 00
M. E. Strode, Driver, Dairy Sales.....	165 00
Ethel Strohmeier, Secretary, University Extension.....	165 00
†L. D. Adams, Lecturer, Modern History.....	165 00
Eva M. Allen, Instructor in Commercial Practice, Southern Branch.....	165 00
R. Benton, Correspondence Teacher, Agriculture.....	165 00
V. F. Blanchard, Assistant, Agricultural Extension.....	165 00
L. M. K. Boelter, Instructor, Electrical Engineering.....	165 00
L. Bonnet, Assistant in Viticulture.....	165 00
C. Bransby, Assistant Professor of Spanish.....	165 00
M. W. Buster, Assistant in Agricultural Extension.....	165 00
W. F. Carroll, Assistant in Agricultural Extension.....	165 00
Helen C. Chandler, Instructor in Fine Arts, Southern Branch.....	165 00
May L. Cheney, Appointment Secretary.....	165 00
Orabel Chilton, Associate in Home Economics, Southern Branch.....	165 00
J. L. Collins, Instructor in Genetics.....	165 00
H. N. Cooper, Curator, Chemistry.....	165 00
Mildred E. Corbin, Assistant in Agricultural Extension.....	165 00
Sarah R. Davis, Assistant Professor of Physical Education.....	165 00
W. P. Duruz, Assistant in Pomology.....	165 00
R. Ellis, Assistant in Agricultural Extension.....	165 00
Maud Evans, Associate in Home Economics, Southern Branch.....	165 00
H. P. Everett, Assistant in Agricultural Extension.....	165 00
Arthur Folger, Superintendent Tests, University Farm.....	165 00
Luey M. Gaines, Instructor in History, Southern Branch.....	165 00
H. Goss, Assistant in Nutrition.....	165 00
L. R. Grunewald, Instructor in Physical Education, Southern Branch.....	165 00
#R. M. Hagen, Assistant Professor of Agricultural Extension.....	165 00
F. F. Halma, Assistant in Plant Physiology in the Citrus Experiment Station.....	165 00
W. F. Hamilton, Assistant in Zoology.....	165 00
Bessie E. Hazen, Instructor in Fine Arts, Southern Branch.....	165 00
Mabel C. Jackson, Teacher in Charge of Seventh Grade, Southern Branch.....	165 00
R. H. Klamt, Assistant in Agricultural Extension.....	165 00
John Leggett, Repairman, University Farm.....	165 00
Agnes Macpherson, Associate in Home Economics.....	165 00
Robert McBride, Assistant Superintendent Cultivation Citrus Experiment Station.....	165 00
T. C. McFarland, Instructor in Electrical Engineering.....	165 00
F. R. Morris, Instructor in Mathematics.....	165 00
R. R. Morse, Instructor in Geology.....	165 00
Dr. J. J. Mundorff, Technical Assistant, Eye Department, University Hospital.....	175 00
F. E. Neer, Instructor in Pomology.....	165 00
Mabel Nettleton, Registrar, Southern Branch.....	165 00
Emily Palmer, Special Agent, Smith Hughes.....	166 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Gladys Palmer, Instructor, Physical Education, Southern Branch.....	163 63
Rosamond Parma, Librarian, Law Library.....	166 66
J. G. Rattray, Mechanic, Chemistry.....	166 66
B. A. Rudolph, Resident Associate, Plant Pathology.....	166 66
Josephine E. Seaman, Instructor in English, Southern Branch.....	166 66
M. A. Silva, Instrument Maker, Lick Observatory.....	166 66
Pauline Sperry, Instructor, Mathematics.....	163 66
Chester Stock, Instructor, Palaeontology.....	163 63
Evelyn Thomas, Instructor, English, Southern Branch.....	166 66
Mary Van Camp, Assistant Agricultural Extension.....	163 66
Hazel Walker, Coordinator, Federal Board University Farm.....	163 63
B. E. Wells, Assistant Supervisor of Practice Teaching, Southern Branch.....	163 63
Belle H. Whitice, Instructor, Industrial Arts, Southern Branch.....	163 63
Jessie Stickel, Technical Assistant, Clinical Laboratory, University Hospital.....	166 67
J. Dixon, Mammalogist, Vertebrate Zoology.....	170 00
Marea Goddard, Assistant, Spanish.....	170 00
H. J. Greif, Associate in Music, Southern Branch.....	170 00
Marie Tims, Superintendent, University Farm.....	170 00
P. W. Barnett, City Buyer, Comptroller's Office.....	175 00
J. S. Barnhart, Collector and Curator, Aquarium.....	175 00
E. L. Bartlett, Instructor in Surgery and Pathologist, University Hospital.....	175 00
R. J. Brower, Associate in Drawing.....	E 175 00
T. Buck, Assistant Professor, Mathematics.....	175 00
W. A. H. Connor, Bill Clerk, Comptroller's Office.....	175 00
C. E. Cox, Assistant in Mechanics and Foreman of Woodwork.....	175 00
W. J. Cummings, Glassblower, Chemistry.....	175 00
A. B. Cummins, Assistant in Agricultural Chemistry.....	175 00
W. D. Drew, Chief Clerk, Citrus Experiment Station.....	175 00
F. C. H. Flossfeder, Assistant Professor of Viticulture and Superintendent of Grounds at University Farm.....	175 00
J. George, Assistant in Mechanics and Foreman of Iron Work.....	175 00
A. J. Greer, Farm Foreman, University Farm.....	175 00
Geo. Hamblin, Hostler, University Farm.....	175 00
J. E. Hoover, Foreman and Carpenter, Lick Observatory.....	175 00
G. P. Kraus, Mechanician, Physics.....	175 00
A. B. Mackinnon, Bookkeeper, Agriculture.....	175 00
#G. A. Merrill, Director of the Wilmerding School of Industrial Arts.....	175 00
W. J. Mossak, Federal Board Instructor, Southern Branch.....	175 00
#R. E. Nebelung, Specialist in Agricultural Extension.....	175 00
C. M. Price, Instructor in Physical Education.....	175 00
#W. R. Ralston, Specialist in Agricultural Extension.....	175 00
K. A. Ryerson, Assistant in Agricultural Extension.....	175 00
A. G. Smith, Chairman, University Extension.....	175 00
H. S. Swarth, Curator of Birds, Museum of Vertebrate Zoology.....	175 00
Sue Van Wagenen, Secretary, University Hospital.....	175 00
R. C. Walden, Clerk, Repairs.....	175 00
A. E. Way, Field Assistant in Viticulture.....	175 00

\$126 to \$150

Stella Bennett, Senior Assistant, Library.....	130 00
Edith M. Calder, Nurse, Infirmary.....	130 00
Joe Guzman, Helper, Dairy Sales.....	130 00
P. Horn, Janitor, California Hall, Janitor, Police.....	130 00
Roxana G. Johnson, Senior Assistant, Library.....	130 00
Mae McCabe, Nurse, University Farm.....	130 00
Caroline McCreery, Nurse, Infirmary.....	130 00
Inez F. Colby, Senior Assistant, Library.....	130 00
Agnes M. Cole, Senior Assistant, Library.....	130 00
Myrtle Hayford, Nurse, Infirmary.....	130 00
L. Quayle, Repairman, University Farm.....	130 00
Bertha S. Rainey, Nurse, Infirmary.....	130 00
Francis Rhodes, Cook, Infirmary.....	130 00
Paul Schulz, Dairy Barn Milker, University Farm.....	130 00
Della J. Sisler, Senior Assistant, Library.....	130 00
Henrietta Steiner, Senior Bookkeeper, Comptroller's Office.....	130 00
Arthur Stottlemayer, Dairy Barn Helper, University Farm.....	130 00
George Lohmiller, Cow Boy, University Farm.....	132 50
A. Nash, Instructor, Occupational Therapy, Habemann Hospital.....	133 00
Emily Spangler, Supervisor, Nursing Education, University Hospital.....	133 00
Annie D. B. Andrews, Associate in Mathematics.....	133 33
Mabel Baird, Assistant in English.....	133 33
I. Barnier, Associate in French.....	133 33
Frances Bockius, Associate in Physical Education.....	133 33
Marie L. Craig, Recorder, Southern Branch.....	133 33
Elizabeth H. Fargo, Librarian, Southern Branch.....	133 33
Josephine Guion, Associate in Physical Education.....	133 33
W. S. Hancock, Federal Board Instructor, Southern Branch.....	133 33
R. W. Jeans, Instructor, Water-coloring and Pen and Ink Drawing.....	133 33

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Anna Krause, Associate in Spanish, Southern Branch.....	133 33
Junette L. Hostis, Associate in French.....	133 33
C. L. McVey, Senior Physician for Men.....	133 33
Nettie Meek, Secretary, Civil Engineering.....	133 33
G. Z. Patrick, Associate in French.....	133 33
Iola G. Kless, Assistant in English.....	133 33
M. N. Shutes, Ophthalmologist.....	133 33
Bessy Sprague, Secretary and Librarian, Architecture.....	133 33
R. E. Sweetland, Assistant in English.....	133 33
Maria T. Tommasini, Associate in Italian.....	133 33
Emily Wilkie, Editorial Reader, Publications.....	133 33
E. P. Willoughby, Mechanical Helper, Mining and Metallurgy.....	133 33
Mrs. A. M. Wheaton, Housekeeping Matron, University Hospital.....	134 00
Walter C. Clifton, Cow Boy, University Farm.....	135 00
M. J. Fortney, Engineer, Lick Observatory.....	135 00
Frank Gerber, Engineer, University Farm.....	135 00
Edwin Hyatt, Cheesemaker, University Farm.....	135 00
Sus M. Love, Assistant, Recorder's Office.....	135 00
Penelope McEntyre, Assistant, Appointment Secretary.....	135 00
L. Moratti, Janitor, Library, Janitors, Police.....	135 00
R. L. Peterson, Storekeeper, Storehouse.....	135 00
Paula Schoenholz, Head Consul, Culture Media, University Hospital.....	135 00
F. C. Shephard, Janitor, Wheeler Hall, Janitors, Police.....	135 00
C. Van Ness, Janitor, University Farm.....	135 00
Mrs. Ida Kenney, Dormitory Superintendent, University Farm.....	136 00
#S. H. Dadisman, Assistant Professor, Agricultural Education, and Supervisor of Classes for Teachers of Agricultural Subjects.....	137 50
#W. W. Mackie, Assistant Professor of Agronomy.....	137 50
James Bickford, Janitor, University Farm.....	138 00
Chas. Dowler, Janitor, University Farm.....	138 00
A. Daggett, Supervisor, Hahnemann Hospital.....	139 00
A. Gunnison, Night Superintendent, Hahnemann Hospital.....	139 00
M. A. Horwege, Supervisor, Hahnemann Hospital.....	139 00
M. R. Joyce, Supervisor, Hahnemann Hospital.....	139 00
F. A. Denhard, Assistant to Purchasing Agent.....	140 00
A. F. Eldridge, Police Officer, Janitors, Police.....	140 00
A. O. Foster, Police Officer.....	140 00
W. J. Lee, Police Officer.....	140 00
Otto May, Mail Carrier, President's Office.....	140 00
Louise Oldenbourg, Assistant Physician for Women and Anesthetist.....	140 00
J. K. Mathison, Helper, Dairy Sales.....	140 00
D. L. Roberts, Chief Clerk, Berkeley.....	140 00
Frank M. Stamper, Laboratory Helper, Physics.....	140 00
Katherine I. Tapscott, Secretary, University Extension.....	140 00
O. P. Taylor, Police Officer.....	140 00
E. M. Kidd, Police Officer.....	140 00
Caroline Coleman, Associate in Physical Education.....	141 66
G. A. Coleman, Instructor in Entomology.....	141 66
Marion B. Knight, Associate, Physical Education.....	141 66
Elizabeth Maier, Chief Clerk, Southern Branch.....	141 66
Violet Marshall, Associate, Physical Education.....	141 66
C. Ballard, Assistant, Physiotherapy, Hahnemann Hospital.....	143 00
D. I. Bassett, Instructor, Occupational Therapy, Hahnemann Hospital.....	143 00
G. Benson, Assistant Physiotherapy, Hahnemann Hospital.....	143 00
F. Bovill, Assistant Physiotherapy, Hahnemann Hospital.....	143 00
Rebecca Cerf, Assistant Technician, University Hospital, Physio-Therapy.....	143 00
G. Reichelдорfer, Assistant Physiotherapy, Hahnemann Hospital.....	143 00
F. Thornton, Assistant Physiotherapy, Hahnemann Hospital.....	143 00
D. Voelckel, Assistant Physiotherapy, Hahnemann Hospital.....	143 00
G. F. Porter, Assistant Superintendent, Hahnemann Hospital.....	144 00
F. Randolph E. Longwell, Foreman, Dairy Sales.....	145 00
#G. W. Galbraith, Supervisor of Classes for Teachers of Trade and Industrial Subjects, Southern Branch.....	145 83
#C. L. Jacobs, Associate Professor of Industrial Education and Supervisor of Classes for Teachers of Trade and Industrial Subjects.....	145 83
Jessie Greenwood, Supervisor, Nursing Education, University Hospital.....	149 00
Annie H. Allen, Associate in Public Speaking.....	150 00
A. Anderson, Associate in English.....	150 00
Edith S. Anderson, Assistant in Spanish.....	150 00
Roy Arnheim, Assistant, University Farm.....	150 00
Sarah Atsatt, Instructor in Biology, Southern Branch.....	150 00
C. L. Austin, Assistant in Pomology.....	150 00
Henry Bachman, Mechanician, Mining and Metallurgy.....	150 00
F. H. Ballou, Assistant in Zoology.....	150 00
Mabel Barnhart, Instructor in Music, Southern Branch.....	150 00
G. Barovetto, Field Assistant in Viticulture.....	150 00
D. T. Batchelder, Specialist in Agricultural Extension.....	150 00
Dr. A. E. Belt, Night Clinic, University Hospital, Out Patient Department, Assistant in Urology, Medical School and Hospitals, Assistant in Research Medicine Hooper Foundation.....	150 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
H. C. Birkett, Mechanic, Berkeley.....	150 00
Agnes E. Brown, Librarian at University Farm School.....	150 00
Harriet Brown, Class Organizer, Los Angeles, University Extension.....	150 14
E. M. Bryant, Technician, University Hospital, Department of Physiology.....	150 00
E. J. Campbell, Assistant in Agricultural Extension.....	150 00
C. D. Carpenter, Poultry Investigations, University Farm.....	150 00
M. N. Casterline, Carpenter, Southern Branch.....	150 00
Carrie E. Castle, Research Assistant, Botulism Investigations.....	150 00
Marie Champy, Associate in French.....	150 00
W. H. Chapman, Mechanic, Chemistry.....	150 00
R. H. Clark, Associate in English.....	150 00
Evelyn Conklin, Assistant in Agricultural Extension.....	150 00
Marjorie W. Cook, Technician, Pathology Research U. S.....	150 00
Mrs. W. R. Crowell, Teacher Home Economics Training School, Southern Branch.....	150 00
Pirie Davidson, Instructor in Zoology, Southern Branch.....	150 00
Annita Delano, Instructor in Fine Arts, Southern Branch.....	150 00
J. A. Denny, Foreman of Cereal Work, Kearney Vineyard.....	150 00
Charles Dooley, Head Janitor, Southern Branch.....	150 00
C. T. Dozier, Associate in Physics.....	150 00
Caroline Duncan, Associate in Public Speaking.....	150 00
E. C. Eby, Assistant in Education and Secretary of the Department.....	150 00
F. M. Essig, Instructor in Botany and Bacteriology, Southern Branch.....	150 00
Helen W. Fancher, Associate in Household Art.....	150 00
Feliz Flugel, Instructor in Economics.....	E150 00
L. K. Freeman, Instructor in Mining.....	150 00
Dora Fritz, Chief Assistant, University Farm.....	150 00
E. L. Furlong, Assistant in Palaeontology.....	150 00
Gus Gabrielli, Foreman, University Farm.....	150 00
L. W. Hahn, Dental Surgeon.....	150 00
E. K. Heller, Instructor in German.....	150 00
C. C. Herbert, Instructor in Automobile Mechanics, Wilmerding School.....	150 00
Katherine Hersey, Instructor in Physical Education, Southern Branch.....	150 00
R. L. Hooper, Assistant in Agricultural Extension.....	150 00
B. Jameson, Instructor in Civil Engineering.....	150 00
H. O. Jenkins, Instructor, University Farm.....	150 00
H. A. L. Jones, Instructor, Electrical Work, Wilmerding School.....	150 00
Katherine Jones, Associate in Landscape Gardening and Floriculture.....	150 00
Martha Jones, Assistant in Pediatrics.....	150 00
Alexander Kaun, Associate in Russian.....	150 00
Mary L. Kleinecke, Associate in English.....	150 00
Hugh Knight, Assistant in Entomology, Citrus Experiment Station and Graduate School of Tropical Agriculture.....	150 00
M. Krunich, Instructor in Serbo-Croatian and French.....	150 00
H. Langlard, Associate in French.....	E150 00
May Lent, Associate in Household Art.....	150 00
Nella J. Martin, Senior Assistant, Library.....	150 00
J. E. Maybeck, Instructor in Carpentry and Cabinetmaking, Wilmerding School.....	150 00
A. M. Meads, Associate University Physician and Urologist.....	150 00
F. H. Mighall, Instructor in Stonework, Wilmerding School.....	150 00
Catherine Flinn, Research Technician, University Hospital, Department of Anatomy.....	150 00
Blythe F. Monroe, Assistant in Soil Technology.....	150 00
A. Montgomery, Repairman, University Farm.....	150 00
Lillian M. Moore, Instructor in Physiology.....	150 00
Caroline B. Morrison, Instructor in Elementary Algebra, Wilmerding School.....	150 00
T. H. Morton, Machinist and Assistant—Mechanics.....	150 00
James Murphy, Chef, University Farm.....	150 00
C. J. Nobmann, Instructor in Civil Engineering.....	150 00
R. F. Newton, Instructor in Chemistry.....	150 00
B. H. Ormand, Assistant in Agricultural Extension.....	150 00
J. F. Osborn, Assistant in Agricultural Extension.....	150 00
S. C. Pepper, Instructor in Philosophy.....	150 00
Hervey Phipps, Veterinary, University Farm.....	150 00
C. F. Pierson, Instructor in Mechanical Arts, Southern Branch.....	150 00
Estella B. Plough, Instructor in Commercial Practice, Southern Branch.....	150 00
G. A. Pomeroy, Associate in Physics.....	150 00
W. C. Pomeroy, Associate in Physics.....	150 00
M. Burney Porter, Appointment Secretary, Southern Branch.....	150 00
J. L. Quail, Assistant in Agricultural Extension.....	150 00
Emily Richards, Superintendent, Los Angeles Medical School.....	150 00
C. H. Robinson, Instructor in Geography, Southern Branch.....	150 00
M. E. Rotchy, Mechanician and Instructor, Physics.....	150 00
Adelaide Samuels, Assistant to Superintendent of Primary Training, Southern Branch.....	150 00
Caroline Schief, Associate in Social Economics.....	150 00
Katherine J. Scott, Instructor in Anatomy.....	150 00
J. P. Sedgley, Senior Bookkeeper, Comptroller's Office.....	150 00
C. D. Shane, Instructor in Mathematics.....	150 00
L. B. Simpson, Assistant, Spanish.....	150 00
Caroline Singleton, Associate in French.....	150 00
Helen Spalding, Lecture Organizer, University Extension.....	150 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
George Spencer, Mechanician, Mining and Metallurgy.....	150 00
E. L. Stanley, Assistant in Agricultural Extension.....	150 00
Constance M. Steel, Chief Editorial Reader, Recorder's Office.....	150 00
Ruth L. Stone, Instructor in Bacteriology.....	150 00
C. B. Story, Teacher, English, University Farm.....	150 00
Mattie Stover, Assistant, Household Science.....	150 00
Nellie B. Sullivan, Instructor in Psychology, Southern Branch.....	150 00
C. C. Swafford, Instructor, Civil Engineering.....	150 00
Anne Swainson, Associate in Textiles, Home Economics.....	150 00
Alice P. Tabor, Instructor in German.....	150 00
E. R. Temperli, Assistant, Agricultural Extension.....	150 00
H. Thiele, Assistant Astronomer, Lick Observatory.....	150 00
G. E. Troxell, Instructor in Civil Engineering.....	150 00
R. J. Trumpler, Assistant Astronomer, Lick Observatory.....	150 00
Dorothy M. Uren, Spanish Assistant.....	150 00
Katherine Vail, Instructor, Dietetics and Dietitian.....	150 00
E. Vuylstekker, Assistant in French.....	150 00
Bertha B. Wardell, Associate in Physical Education, Southern Branch.....	150 00
J. B. Washburn, Associate in Accounting.....	150 00
J. R. Waters, Assistant in Agricultural Extension.....	150 00
George E. Wells, Engineer, Southern Branch.....	150 00
Eva West, Librarian, University Hospital and Research Medicine Library.....	150 00
David Westwater, Lecture Room Helper, Physics.....	150 00
A. R. Williams, Instructor, Mathematics.....	150 00
Florence Wilson, Associate in Home Economics, Southern Branch.....	150 00
Dorothy Wood, Assistant in Anesthesia.....	150 00
Evelyn M. Woodland, Instructor in English Branches, Wilmerding School.....	150 00
M. S. Woolf, Night Clinic, University Hospital, Out Patient Department, and Instructor in Surgery, Medical School and Hospital.....	150 00
Roy Wray, Field Assistant, University Farm.....	150 00
\$101 to \$125.	
D. Casilang, Potwasher, University Hospital.....	101 14
F. Macalino, Diet Kitchen Porter, University Hospital.....	101 14
M. Musngi, Trayman, University Hospital.....	101 14
T. Burns, Porter, Hahnemann Hospital.....	102 00
Vincent Arca, Kitchen Helper, Infirmary.....	102 70
Florence Blagtu, Kitchen Helper, Infirmary.....	102 50
Madge L. Ayer, Stenographer and Clerk, Physical Education, Men.....	105 00
Rose Clark, Bid Clerk, Purchasing Department.....	105 00
M. Clark, Delivery Clerk, Comptroller's Office.....	105 00
F. W. Eckert, Laborer, Citrus Experiment Station.....	105 00
John Frieson, Potwasher, University Farm.....	105 00
G. Galleano, Animal Caretaker, Hooper Foundation and Caretaker, Dentistry, Research.....	105 00
Ethel Hauser, Stenographer and Assistant, Jurisprudence.....	105 00
Gordon Wallace, Laborer, Citrus Experiment Station.....	105 00
A. McMillan, Laborer, University Farm.....	107 00
J. W. Brown, Janitor, University Farm.....	107 50
C. W. Holmes, Janitor, University Farm.....	107 50
Catalina Aguilung, Supervisor Nursing Education, University Hospital.....	108 00
Mollie Johnson, Nurse, University Hospital in Public Health Nursing and Social Service.....	108 00
Nicholas May, Orderly, Nursing Education, University Hospital.....	108 00
Mary A. McCleary, Nurse, University Hospital Public Health Nursing and Social Service.....	108 00
Beulah Michels, Nurse, University Hospital, Public Health Nursing and Social Service.....	108 00
Emily Reed, Chief Clerk, University Hospital, Out Patient Department.....	108 00
Rose Steinhart, Nurse, University Hospital Public Health Nursing and Social Service.....	108 00
Magnó Valora, Orderly, Nursing Education, University Hospital.....	108 00
F. E. Bourne, Helper, Geology and Mineralogy.....	108 33
Elizabeth P. Sturtevant, Assistant Librarian, Southern Branch.....	108 33
M. Suermont, Nurse, University Hospital, Public Health Nursing and Social Service.....	108 00
Elsie Brink, Chemist, Botulism Investigations.....	110 00
Elta L. Camper, Senior Assistant, Library.....	110 00
Fern Dale, Clerk, University Farm.....	110 00
Gustave Dorn, Busboy, University Farm.....	110 00
J. S. Gage, Laborer, Citrus Experiment Station.....	110 00
Constance Gray, Stenographer and Clerk, Chemistry.....	110 00
Elsa Grim, Stenographer, University Farm.....	110 00
Elinor Hand, Clerical Assistant, Library.....	110 00
Chloe Harworth, Clerk, University Farm.....	110 00
Beth Hemmy, Stenographer, University Farm.....	110 00
B. S. Henry, Orchard Laborer, Agriculture.....	110 00
Edith Johnson, Bookkeeper, University Farm.....	110 00
Esther Johnson, Stenographer, University Farm.....	110 00
M. König, Chief Stenographer, Agriculture.....	110 00
Bert Leap, Tractor Operator, Citrus Experiment Station.....	110 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Dorothy Lewis, Stenographer-Clerk, Hooper Foundation.....	110 00
Minnie A. Lewis, Clerical Assistant, Library.....	110 00
Ivander, MacIver, Junior Assistant, Library.....	E110 00
Louise Madson, Stenographer, Berkeley.....	110 00
Eva Rosenthal, Secretary, University Farm.....	110 00
M. T. Shain, Assistant, Scripps Institute.....	110 00
Anna A. Simmonds, Stenographer-Clerk, Anthropology.....	110 00
Ralph Taylor, Assistant, Scripps Institute.....	110 00
Mildred Valerga, Editorial Assistant, Recorder's Office.....	110 00
Elizabeth Wagner, Chemist, Botulism Investigations.....	110 00
Florence White, Mimeographer, University Extension.....	110 00
H. G. White, Assistant Curator in Osteology, Museum.....	110 00
Margaret W. Wythe, General Assistant, California Museum of Vertebrate Zoology.....	110 00
Louise Young, Stenographer, University Farm.....	110 00
Louis Armandis, Helper, University Hospital.....	112 00
H. L. Armes, Houseman, Hahnemann Hospital.....	112 00
M. Douglas, Matron, Hahnemann Hospital.....	112 00
L. B. Long, Night Clerk, University Hospital.....	113 00
Edith Carlton, Stenographer, College of Letters and Science.....	115 00
Louise Howell, Los Angeles Bookkeeper, University Extension.....	115 00
Helen Junor, Assistant Record Clerk, Comptroller's Office.....	115 00
V. Opal McGaw, Stenographer-Clerk, Mining and Metallurgy.....	115 00
S. L. Palmer, Stenographer, Agriculture.....	115 00
M. A. Queen, Assistant Cashier, University Farm.....	115 00
Jennie C. Sanden, Clerk, Berkeley.....	115 00
Josephine Smith, Salary Roll Clerk, Comptroller's Office.....	115 00
M. P. Taylor, Assistant in Stock Room, Physical Education, Men.....	115 00
A. M. Hobe, Assistant, Liek Observatory.....	116 66
Edna M. Russ, Assistant in Pomology.....	116 66
A. Hallmeyers, Janitor, University Farm.....	118 00
Teresa Casenave, Nurse, Infirmary.....	120 00
Jane Easton, Clerk, Southern Branch.....	120 00
Estella Fulton, Secretary, Department of Anatomy, University Hospital.....	120 00
Rhoda Halbert, Nurse, Infirmary.....	120 00
S. B. Hoff, Storekeeper, University Farm.....	120 00
Susan Kern, Bookkeeper, University Hospital.....	120 00
Ruth Lobaugh, Los Angeles Chief Clerk, University Extension.....	120 00
Alice I. Lyser, Senior Assistant, Library.....	120 00
Lulu McClay, Nurse, Infirmary.....	120 00
Shirley O'Banion, Nurse, Infirmary.....	120 00
Myra O'Brien, Senior Assistant.....	120 00
Jessie Perkins, Nurse, Infirmary.....	120 00
Delia Peterson, Nurse, Infirmary.....	120 00
Gertrude E. Phipps, Senior Assistant, Library.....	120 00
E. L. Pitman, Dairy Barn Milker, University Farm.....	120 00
Jean Rogerson, Nurse, Infirmary.....	120 00
Paul J. Shuller, Assistant, Storehouse.....	120 00
Arthur Warburton, Preparator, Anthropology.....	120 00
B. Wittechen, Secretary, Printing Office.....	120 00
W. E. Magee, Professor of Physical Culture.....	122 22
Grace Crowe, Supervisor, Nursing Education, University Hospital.....	123 00
Alice Firth, Supervisor, Nursing Education, University Hospital.....	123 00
Catherine Fitts, Supervisor, Nursing Education, University Hospital.....	123 00
Gertrude Polendorf, Supervisor, Nursing Education, University Hospital.....	123 00
Frederick Hartman, Supervisor, Nursing Education, University Hospital.....	123 00
Petrea Ludwig, Supervisor, Nursing Education, University Hospital.....	123 00
Persis Marriage, Supervisor, Nursing Education, University Hospital.....	123 00
Marguerite McLean, Supervisor, Nursing Education, University Hospital.....	123 00
Agnes Speed, Supervisor, Nursing Education, University Hospital.....	123 00
Sue Wilkins, Supervisor, Nursing Education, University Hospital.....	123 00
Sara Bloom, Supervisor, Nursing Education, University Hospital.....	124 00
Brigid Curtin, Supervisor, Nursing Education, University Hospital.....	124 00
Eleanor Goss, Supervisor, Nursing Education, University Hospital.....	124 00
Mildred Lantz, Dietitian, University Hospital.....	124 00
G. Abraham, Janitor, Wheeler Hall.....	125 00
T. Andreggan, Janitor, Gilman Hall.....	125 00
Frances Anderson, Chief Clerk, President's Office.....	125 00
Edna W. Bailey, Supervisor of the Teaching of Science, University High School.....	125 00
J. Banetti, Laborer, University Farm.....	125 00
E. Barto, Clerk, University Extension.....	125 00
Margaret Beattie, Associate in Public Health.....	125 00
Jessie F. Bell, Secretary, Pediatrics, University Hospital.....	125 00
B. Blasier, Bookkeeper, Hahnemann Hospital.....	125 00
G. W. Brooks, Helper, Chemistry.....	125 00
Mary W. Broyles, Instructor in Nursing and Superintendent of Dental Hygienists.....	125 00
B. Buchli, Janitor, Architecture Building.....	125 00
Laura Cairns, Associate in Hygiene.....	125 00
R. Canall, Janitor, Military Building, and Marble Cleaner.....	125 00
F. Candido, Janitor, Budd Hall and Veterinary Laboratory.....	125 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Margaret Carhart, Associate in English, Southern Branch	125 00
D. B. Clark, Assistant in Philosophy	125 00
Elizabeth Coats, Secretary, University Hospital Obstetrics and Gynecology	125 00
Katherine Collins, Associate in English, Southern Branch	125 00
L. J. Condrotte, Janitor, Library	125 00
Beatrice Q. Cornish, Associate in Spanish	125 60
S. Crosby, Assistant in Mechanics, Southern Branch	125 00
W. Crosby, Janitor, Agricultural Chemistry	125 00
N. W. Cummings, Assistant, Scripps Institute	125 00
J. E. DelaRoi, Janitor, Budd Hall and South Hall	125 00
J. Dillon, Engineering-Janitor	125 00
Mary E. Douglass, Assistant Teacher, Kindergarten, Southern Branch	125 00
M. W. Dula, Orchard Farm, University Farm	125 00
J. Eastman, Janitor, California Hall	125 00
S. Edgar, Janitor, Hearst Hall	125 60
O. Engstrom, Janitor, Mining	125 00
Christine Essenberg, Zoologist and Librarian Biological Research	125 00
W. L. Fisher, Janitor, Observatory and Mechanics Building	125 00
G. L. Foster, Associate in Biochemistry	125 00
Beryl Gange, Secretary to Principal, University High School	125 60
J. Giorsetto, Janitor, Library	125 00
E. F. Gordon, Janitor, Wheeler Hall	125 00
W. W. Grieves, Helper in Veterinary, University Farm	125 00
P. Hagenson, Janitor, Gymnasium and Entomology	125 00
H. Hahn, Janitor, Hygiene and Pathology	125 00
H. W. Harvey, Instructor of Neurology	125 00
G. Helmore, Janitor, Chemistry	125 00
R. Hemphill, Janitor, Gymnasium	125 00
Albert Hoffman, Helper, Hog Serum Sales	125 00
S. Hubbell, Janitor, Chemistry	125 00
R. R. Huestis, Assistant, Scripps Institute	125 00
A. Imperiale, Janitor, Wilmerding School	125 00
T. Jane, Janitor, Physiology and Anthropology	125 00
O. Johansen, Janitor, Mining	125 00
F. Johnson, Janitor, East Hall	125 00
C. Jorgensen, Janitor, Bacon Hall	125 00
James Kadak, Foreman, University Farm	125 00
W. J. Lampkin, Garage Foreman, University Farm	125 60
I. W. Leslie, Janitor, Library	125 00
P. J. Levy, Janitor, Mechanics	125 00
Sidney Lewin, Assistant, University Farm	125 00
O. Lindberg, Janitor, Boalt Hall	125 00
Vernie Litch, Technician, Photography, University Hospital	125 00
J. M. Lynch, Janitor, Anatomy and Gymnasium	125 00
H. Mallmann, Janitor, Library	125 00
Amy Marshall, Secretary, Lick Observatory	125 00
A. McCann, Janitor, Home Economics	125 00
E. McDonald, Supervisor, Nursing Education, University Hospital	125 00
T. Meves, Janitor, Hilgard Hall	125 00
D. B. Miller, Associate in Drawing	125 00
O. A. Miller, Head Janitor, Dentistry	125 00
Anna C. Moody, Secretary, General Medicine, University Hospital	125 00
Ruth Moody, Assistant in Economics	125 00
Hazel Morehouse, Supervisor, Nursing Education, University Hospital	125 60
Margaret E. Murdock, Assistant Dean of Women	125 00
O. Olafson, Janitor, Hilgard Hall	125 00
C. S. Perine, Janitor, Freshman Chemistry	125 00
W. A. Perkins, Assistant in Pathology and Surgical Pathology	125 00
I. N. Prindle, Janitor, Library	125 00
A. C. Renfree, Janitor, California Hall	125 00
Ada Rippey, Secretary, Comptroller's Office	125 00
Frieda S. Robscheit, Assistant in Research Medicine	125 00
James Ross, Assistant, Scripps Institute	125 00
M. V. Rowley, Janitor, Wheeler Hall	125 00
Gertrude Schieck, Secretary, University Hospital	125 00
A. Schwyter, Janitor, Agriculture Hall	125 00
Louise Shafor, Historian, University Hospital	125 00
P. Steindorff, Choragus, Music Department	125 00
C. C. Storer, Janitor, Wheeler Hall	125 00
Pearl Taylor, Clerk, University Extension	125 00
Charles Temme, Janitor, Lick Observatory	125 00
Marietta Voorhees, Assistant to the Dean of Women	125 00
May V. Wallace, Assistant in Public Health	125 00
W. Walsh, Janitor, Bacon Hall and Botany	125 00
G. Watson, Tower Operator, Site	125 00
E. W. Weston, Bookkeeper, University Farm	125 00
G. Wikstedt, Janitor, Drawing	125 00
D. Williams, Janitor, South Hall	125 00
Charles Wilson, Laborer, Citrus Experiment Station	125 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
G. R. Wright, Janitor, California and Wheeler Hall	125 00
S. Leslie Wright, Instructor, Southern Branch	125 00
G. Zappettini, Janitor, Hilgard Hall	125 00
E. Zugnoni, Janitor, Wheeler Hall	125 00
\$76.00 to \$100.00.	
Rose Athenaur, Typist, Comptroller's Office	80 00
Lillian Bertram, Stenographer, Comptroller's Office	80 00
Ruth Burton, Clerk, Comptroller's Office	80 00
Daniel Cronin, Laborer, University Farm	80 00+
E. Bailey, Clerk, Hahnemann Hospital	80 00
Lucy C. Farrell, Assistant in Radiography, Dentistry	80 00
M. Flammong, Medical and Nursing Services, Hahnemann Hospital	80 00
J. W. Gartland, Fireman, University Farm	80 00
Lily Hartweg, Salad-Girl, University Farm	80 00
Gus Hokinson, Laborer, University Farm	80 00
Eleanor Howard, Secretary and Librarian, Pathology, University Hospital	80 00
Alice Lawrence, Telephone Operator	80 00
S. Lott, Janitor, Dentistry	80 00
Marguerite McNally, Clerk, Comptroller's Office	80 00
Eva E. Martin, Assistant, Recorder's Office	80 00
Hazel Morse, History Clerk, University Extension	80 00
Blanche Otter, Index Clerk, Appointment Secretary	80 00
Blanche Pendergast, Stenographer, Comptroller's Office	80 00
E. Ralston, Medical and Nursing Services	80 00
Mrs. E. M. Schulz, Order Clerk, Comptroller's Office	80 00
Ida S. Sinai, Librarian, University Extension	80 00
Doris Smith, Clerk, University Extension	80 00
Mrs. B. Strumbaugh, Janitress, University Farm	80 00
S. E. Sutton, Janitor, Dentistry	80 00
Veola A. Swanson, File Clerk, University Extension	80 00
Viola Symons, Clerk, Recorder's Office	80 00
Ruby Teller, Stenographer, Citrus Experiment Station	80 00
Miss H. A. Walker, Assistant, Botany	80 00
Roberta Wells, Mail Clerk, Comptroller's Office	80 00
Fauline Wilkinson, Junior Assistant, Library	80 00
Vera Wilson, Admission Clerk, University Hospital	80 00
Ruth Windrom, Laboratory Helper, Agriculture	80 00
Margaret W. Skidmore, Assistant Secretary, Engineering	82 50+
Gertrude Darnelle, Telephone Operator, University Hospital	83 00
W. C. Alvarez, Assistant Professor, Research Medicine	83 33
G. L. Bean, Clinical Professor of Operative Dentistry and Dental Porcelain	83 33+
J. U. Calkins, Jr., Lecturer at Law	83 33+
H. B. Carey, Assistant Professor of Anatomy, Materia Medica and Therapeutics, Dentistry	83 33+
Ford Carpenter, Lecturer in Meteorology, Southern Branch	83 33+
W. E. Colby, Lecturer in Law of Mines and Water	83 33+
M. E. Cummings, Assistant Professor of Modeling	83 33
M. W. Dobrzensky, Lecturer in Commercial Law	E 83 33+
Arthur Fern, Armorer, Military Science and Tactics	83 33
Kate Gompertz, Orthopedist	83 33
Virginia Graham, Instructor in Music	E 83 33
R. S. Kuykendall, Assistant in History	83 33
Beatrice McLean, Library Assistant, Southern Branch	83 33
J. T. Nance, Professor of Military Science and Tactics	83 33+
W. A. Noyes, Jr., Teaching Fellow, Chemistry	83 33
Ida Pattison, Janitress, Southern Branch	83 33
J. B. Ramsey, Teaching Fellow, Chemistry	83 33
Cecile Reau, Lecturer in French	83 33
J. W. Sanderson, Technical Assistant, University Hospital, Department of Physiology	83 33
W. F. Sharp, Professor of Clinical Prosthodontia, Dentistry	83 33+
J. G. Sharp, Professor of Principle and Practice of Surgery, Dentistry	83 33+
A. H. Suggett, Professor of Orthodontics, Dentistry	83 33+
M. E. Tindall, Janitress, Southern Branch	83 33+
M. Wahrhaftig, Lecturer in Law	83 33+
B. W. Wheeler, Assistant in History	83 33
R. H. Scioberti, Teaching Fellow in Astronomy and French	84 72
Virginia Atchison, Stenographer, University Extension	85 00
Helen Auberlin, Stenographer, Purchasing Department	85 00
Inez Carver, Clerical Assistant, Household Art	85 00
Vera Chatfield, Clerk, Recorder's Office	85 00
Claudine Davies, Librarian, Physics	85 00
Gladys Gibson, Stenographer, University Farm	85 00
Vivian C. Gordon, Statistical Clerk, University Extension	85 00
Margaret Jackson, Stenographer, Infirmary	85 00
Louise Leverich, Stenographer, University Extension	85 00
F. E. McLaren, Chief Clerk, Physical Education, Men	85 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
K. McLaughlin, Filing Clerk, Agriculture	85 00
Vera Manetta, Stenciller, University Extension	85 00
Gertrude Mann, Technician, Surgical Pathology, University Hospital	85 00
Laura K. Milton, Stenographer, Graduate Division	85 00
Elve Wickman, Typist, University Farm	85 00
Geraldine Preatzel, Price Clerk, University Hospital	85 00
Martha Runkel, Typist Clerk, Educational	85 00
Mrs. E. W. Smith, Inventory Clerk, Comptroller's Office	85 00
Mrs. M. Smith, Record Clerk, University Extension	85 00
W. McCracken Smith, Bookkeeper, University Extension	85 00
George Watson, Teamster, Agriculture	85 00
Berenice Woods, Junior Bookkeeper, Comptroller's Office	85 00
William Moran, Porter, University Hospital	88 00
Monica Alexander, Milk Test Assistant, University Farm	90 00
Mrs. F. M. Armstrong, Stenographer, Agriculture	90 00
A. Baxley, Stenographer, Agriculture	90 00
Lillie F. Baxter, Stenographer, Agriculture	90 00
Gladys Bennett, Stenographer, Smith-Hughes, Southern Branch	90 00
Fred Buehler, Laborer, University Farm	90 00
Edith M. Case, Stenographer, Agriculture	90 00
Thomas G. Clark, Clerical Assistant, Library	90 00
A. S. Crew, Druggist, Los Angeles, Medical School	90 00
Josephine Eichbaum, Technician in Serology, University Hospital, Clinical Laboratory	90 00
Geraldyn Elwell, Stenographer, Publications	90 00
Louise Evans, Junior Bookkeeper, Comptroller's Office	90 00
Andrew Gallagher, Janitor, Los Angeles Medical School	90 00
Esther D. Hahn, Junior Assistant, Library	90 00
Marion Harris, Junior Assistant, Library	90 00
Theda W. Hyde, Junior Bookkeeper, Comptroller's Office	90 00
Mrs. R. T. Irvine, Stenographer, Agriculture	90 00
Grace Jones, Telephone Operator, Southern Branch	90 00
Alfretta Jordan, Clerk, Southern Branch	90 00
Elizabeth Keal, Stenographer, Agriculture	90 00
Harriet H. Kelly, Stenographer, Recorder's Office	90 00
Dagmar S. Klitgaard, Cashier, Dentistry	90 00
Herman Kuch, Clerk, Military Science and Tactics	90 00
M. R. Low, Laborer, Citrus Experiment Station	90 00
M. Martindale, Stenographer, University Farm	90 00
Edith M. Maslin, Junior Assistant, Library	90 00
Virginia Mauck, Bookkeeper, University Hospital	90 00
Mary Miller, Assistant, Spanish	90 00
J. N. Moore, Foreman of Chico Forestry Station	90 00
Bessie E. Nelson, Junior Assistant, Library	90 00
Mrs. Marguerite O'Connor, Stenographer, Dentistry	90 00
Anna Phelps, Extension Clerk, Comptroller's Office	90 00
Adelaide Pratt, Clerk, Recorder's Office	90 00
J. Edna Schaner, Technician, Surgical Pathology, University Hospital	90 00
Flora B. Sears, Stenographer, Recorder's Office	90 00
Ethel R. Shinkwin, Stenographer-Clerk, Mechanics	90 00
Vera Snell, Secretary, University Hospital	93 00
Marion A. Sweeney, Technical Assistant, Hooper Foundation	90 00
Leta Wearne, Stenographer, Citrus Experiment Station	90 00
Emma Wedemeyer, Clerk, Eye Department, University Hospital	90 00
Mabel C. Wells, Small Order Clerk, Comptroller's Office	90 00
Joseph Wernette, Night Watchman, Southern Branch	90 00
Margaret N. White, Junior Assistant, Library	90 00
Katherine Wickson, Junior Assistant, Library	90 00
C. Bissell, Assistant in French	91 66
Estella D. Lake, Library Assistant, Southern Branch	91 66
L. Pavid, Assistant in French	91 66
Harry Trotter, Coach, Southern Branch	91 66†
Herman Loeber, General Service Elevator Operator, University Hospital	92 00
Mary T. Paine, Assistant in Mathematics	93 75
Angele H. Bailey, Stenographer, Agriculture	95 00
E. R. Bailey, Stenographer, Agriculture	95 00
R. H. Carnahan, Teamster, Citrus Experiment Station	95 00
Mrs. E. H. Carrigan, Stenographer, Citrus Experiment Station	95 00
Leta Corcoran, Stenographer, University Farm	95 00
Mrs. M. M. Dornin, Bid Clerk, Purchasing Department	95 00
Estelle Edmundson, Bid Clerk, Purchasing Department	95 00
Irma Filbert, Stenographer, University Farm	95 00
Mildred E. Ford, Clerk, Chemistry	95 00
Tillie Genter, Assistant, Scripps Institute	95 00
Gladys Gibson, Stenographer, Education	95 00
Florence Greenwald, Los Angeles, Stenographer, University Extension	95 00
H. G. Hull, Laborer, Citrus Experiment Station	95 00
C. A. Johnson, Janitor, Citrus Experiment Station	95 00
Mrs. E. L. Knight, Stenographer, Agriculture	95 00
Margaret Maybeck, Order Clerk, Comptroller's Office	95 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Robert McGill, Beef Barn Helper, University Farm.....	95 00
Grayce McKay, Stenographer, Agriculture.....	95 00
Nell McLaughlin, Head Stenographer, Appointment Secretary.....	95 00
Nellie Meck, Poultry Assistant, University Farm.....	95 00
Margaret M. Moir, Stenographer, Agriculture.....	95 00
Charles Nettleship, Janitor, Citrus Experiment Station.....	95 00
Edith Quackenbush, Junior Bookkeeper, Comptroller's Office.....	95 00
W. G. Youngquist, Bid Clerk, Comptroller's Office.....	95 00
L. W. Allen, Assistant in Music and Band Instructor in Military Science and Tactics.....	95 83
Ida Hyde, Dormitory Matron, Housekeeping Department, University Hospital.....	99 00
O. K. Allen, Anesthetic Administrator, Hahnemann Hospital.....	100 00†
Margaret Alter, Nurse, Infirmary.....	100 00
Veda Anderson, President's Office, Stenographer.....	100 00
R. L. Ansell, Roentgenologist.....	100 00
Miss E. Bates, Stenographer, University Farm.....	100 00
Helen P. Bates, Assistant, Economics.....	100 00
Dixie Bell, Cashier, University Hospital.....	100 00
Helen Bergfried, Associate in Botany.....	100 00
T. Beinhart, Stenographer, Agriculture.....	100 00
Tom Berry, Drayman, University Farm.....	100 00
Edna C. Berton, Stenographer, Recorder's Office.....	100 00
Mary E. Blayne, Assistant, Mailing Room, Agriculture.....	100 00
H. G. Blowers, Fireman, University Farm.....	100 00
Mrs. E. Bock, Stenographer, Agriculture.....	100 00
D. Botteri, Laborer, University Farm.....	100 00
T. Bowcock, Laborer, University Farm.....	100 00
T. A. Boyd, Assitant Gardener, Southern Branch.....	100 00
L. M. Boyers, Assistant Physician for Men.....	100 00
Helen A. Brandt, Clerical Assistant, Library.....	100 00
Bertha Brown, Stenographer, Clerk, Military Science and Tactics.....	100 00
Vera Brown, Stenographer, Agriculture.....	100 00
F. Bryant, Maid, Hahnemann Hospital.....	100 00
Francis Burke, Bookkeeper, University Farm.....	100 00
Julia Burrell, Matron and Clerk, Physical Education, Women.....	100 00
Gladys Campbell, Recorder, University Extension.....	100 00
Hazel Card, Secretary, General Surgery, University Hospital.....	100 00
A. Carlson, Janitor, Southern Branch.....	100 00
Ruth E. Carson, Technician, Surgical Pathology, University Hospital.....	100 00
Reba Charmak, Nurse, University Hospital Public Nursing and Social Service.....	100 00
T. H. Chen, Assistant in Chinese.....	100 00
Ruth Christianson, Technician in Biochemistry, Clinical Laboratory, University Hospital.....	100 00
Camilla Clark, File Clerk, University Extension.....	100 00
Harry E. Coffey, Morgue Keeper, Surgical Pathology, University Hospital.....	100 00
Sue Coghlin, Stenographer, University Hospital.....	100 00
J. R. Collins, Plant Assistant, University Farm.....	100 00
Marie Costello, Stenographer, Zoology.....	100 00
Anita Cox, Technician in Chemistry, University Hospital, Clinical Laboratory.....	100 00
Martin Crane, Janitor, University Farm.....	100 00
Ella Crawford, Secretary, University Hospital.....	100 00
Alice Crook, Stenographer, Comptroller's Office.....	100 00
Lilla Belle Dailey, Librarian, Citrus Experiment Station.....	100 00
P. H. Daus, Assistant in Mathematics.....	100 00
J. A. Desmond, Janitor, Southern Branch.....	100 00
Roy Dix, Assistant Janitor, Southern Branch.....	100 00
Bertha Dubovsky, Bacteriologist, Botulism Investigations.....	100 00
Harriet Ellsworth, Stenographer, College of Commerce.....	100 00
Marian Farrington, Laboratory Technician, Infirmary.....	100 00
A. J. Faso, Animal Caretaker, Hooper Foundation.....	100 00
Florence Field, Assistant, Botulism Investigations.....	100 00
L. Finley, Stenographer, Hahnemann Hospital.....	100 00
R. Forbes, Barn Laborer, Site.....	100 00
Lillian Franklin, Secretary and Assistant Director.....	100 00
A. W. Freyer, Stenographer, University Farm.....	100 00
Fern B. Gale, Record Clerk, Agriculture.....	100 00
E. L. Bilcreest, Assistant in Surgery and Resident, Hahnemann Hospital.....	100 00
Alice M. Giles, Technician in Serology, University Hospital, Clinical Laboratory.....	100 00
Charles Gilman, Storekeeper, Chemistry.....	100 00
C. H. Gilmore, Janitor, University Farm.....	100 00
Margaret E. Grieg, Office Assistant, Wilmerding School.....	100 00
Barbara N. Grimes, Lecturer in Law and Social Economics.....	100 00
C. R. Giles, Instructor in Prosthetic Dentistry.....	100 00†
Grace Hamilton, Voucher Clerk, Comptroller's Office.....	100 00
C. Hanson, Laborer, University Farm.....	100 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
W. R. Hansen, Plant Assistant, University Farm	100 00
Edna Harrington, Technician and Clerk, University Hospital, Dermatology	100 00
J. B. Harrington, Instructor, University Farm	100 00
Stella Harrison, Telephone Operator, Telephone	100 00
Mrs. Bernice D. Hartley, Stenographer-Clerk, Dentistry	100 00
W. J. Hawkins, Assistant in Clinical Dentistry	100 00
Abbie Hawley, Stenographer, Economics	100 00
Helen M. Hill, Vocational Education Office Assistant	100 00
S. A. Hill, Clinical Professor of Homeopathic Medicine	100 00†
Nettie M. Hobart, Clerk, Southern Branch	100 00
R. M. Hunt, Assistant Curator of Birds, Vertebrate Zoology	100 00
A. F. Hurd, Helper, Architecture	100 00
H. K. Ihrig, Assistant in Chemistry	100 00
Henrica Ilchan, Office Manager, Publications	100 00
A. Isola, Scavenger, Site	100 00
Margaret Jackson, Senior Receiving Clerk, Recorder's Office	100 00
Marlin F. Jackson, Janitor, Southern Branch	100 00
Charles Keaton, Assistant Gardener, Southern Branch	100 00
M. M. Kendall, Stenographer, Agriculture	100 00
Dan J. Larky, Laborer, University Farm	100 00
J. C. C. LeClerq, Assistant in French	100 00
Llewellyn L. Loud, Gardener and Janitor, Anthropology	95 00
G. B. Marsh, Teaching Fellow, Spanish	100 00
Katherine McBride, Technician, Hooper Foundation	100 00
M. Ralph McBride, Buttermaker, University Farm	100 00
Ruby McClain, Nurse, Southern Branch	100 00
Winifred Merriam, Stenographer, Vocational Education, Smith-Hughes Industrial Act	100 00
Ignatius McGuire, Clerical Assistant, Library	100 00
Mrs. E. D. Merchant, Stenographer, Agriculture	100 00
Mitchell Mills, Janitor, Southern Branch	100 00
Evelyn Mitchell, Stenographer, Agriculture	100 00
Seiichi Miyasaki, Technician, Hooper Foundation	100 00
Gladys Murphy, Assistant in Philosophy, Assistant in Public Speaking	100 00
C. Noonan, Night Watchman, University Farm	100 00
M. V. Nowbray, Assistant, Drawing	100 00
Mabel C. Olsen, Stenographer, Comptroller's Office	100 00
Louise A. Patten, Associate in Public Speaking	100 00
Anna Peterson, Clerk, University Extension	100 00
Henry D. Phillips, Teaching Fellow, Spanish	100 00
A. L. Price, Editorial Work	100 00†
C. P. Redington, Stenographer, University Farm	100 00
Dorothy Riedy, Technician in Biochemistry, University Hospital, Clinical Laboratory	100 00
Agnes Robb, File Clerk, Comptroller's Office	100 00
Francis J. Roberts, Technical Assistant, Hooper Foundation	100 00
W. R. Robinson, Assistant in Economics	100 00
B. S. Rosen, Dental Surgeon	100 00
Dorothy Rowland, Stenographer, President's Office	100 00
Annette Ruggles, Secretary, University Hospital	100 00
Gladys Saile, Storekeeper, Chemistry	100 00
Hallie Samson, Clerk, University Farm	100 00
Alice Schaefer, Secretary, Botulism Investigations	100 00
Helen Schieck, Assistant Secretary, University Hospital	100 00
Margaret Schulze, Instructor in Obstetrics and Gynecology	100 00
William Scott, Janitor, Southern Branch	100 00
Fred Sheldon, Housekeeping Porter, University Hospital	100 00
Ethel Sherman, Superintendent of Infirmary	100 00
Anna Shultis, Stenographer, University Farm	100 00
F. Scott Smith, Helper, Civil Engineering	100 00
J. W. Smith, Irrigator, Citrus Experiment Station	100 00
Douglas D. Stafford, Technician, Pathology Research, United States	100 00
D. V. Steed, Assistant in Mathematics	100 00
Mary Stockie, Secretary, University Hospital, Department of Biochemistry	100 00
Josephine Sullivan, Stenographer, Comptroller's Office	100 00
Cloris V. Thaxter, Stenographer-Clerk, Mechanics	100 00
Edith Ueland, Assistant in Physical Education	100 00
Helen M. Ufford, Stenographer-Clerk, Infirmary Hygiene	100 00
A. Van Deuser, Assistant Gardener, Southern Branch	100 00
Julian R. Waybur, Supervisor Music, University Extension	E100 00†
C. Weaver, Laborer, University Farm	100 00
Ed. Webber, Janitor, Southern Branch	100 00
Mark Weil, Plant Assistant, University Farm	100 00
Osalin Wells, Clerical Assistant, Library	100 00
Ella Weston, Technician, University Hospital, San Francisco City and County Hospital	100 00
Pauline Whitman, Technician, Surgical Pathology, University Hospital	100 00
Miss M. J. Williamson, Assistant, Drawing	E100 00
Ben Wilson, Technical Assistant, University Hospital Department of Biochemistry	100 00
Clara K. Wright, Stenographer, Agriculture	100 00
R. V. Wright, Specialist in Agricultural Extension	100 00‡

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	\$51.00 to \$75.00.	Monthly Salary
A. E. Sagehorn, Hog Barn Helper, University Farm		52 50
Rose Militor, Nurse, University Hospital, Public Health Nursing and Social Service		54 00+
Katherine Barton, Janitress, Hooper Foundation		55 00
Kathryn Hughes, Messenger, University Extension		55 00
Lillian Lizee, Clerk, Physics		55 00
Kunisada Kiyasu, Resident Interne, Medical Education, University Hospital		56 00
C. E. Seaman, Assistant in Biology, Dentistry		56 00+
Susan Cobb, Teaching Fellow in English		56 25
K. R. Edlund, Assistant in Chemistry		58 33
Ben Einzig, Assistant in Physical Education, Southern Branch		58 33
E. C. Gudde, Assistant in German		58 33
W. H. Hampton, Assistant in Chemistry		58 33
T. Lawson, Assistant in Anatomy		58 33
R. W. Miller, Assistant in Chemistry		58 33
P. H. Arnot, Assistant in Obstetrics and Gynecology and Assistant Resident University Hospital		60 00
E. L. Barney, Instructor, Hahnemann Hospital, Supervisor of Nursing Education, University Hospital		80 00+
E. W. Blair, Assistant in Physiology		60 00+
E. Bohamon, Nurse, Los Angeles Medical		60 00
M. M. Booth, Assistant in Surgery and Asst. Resident, University Hospital		60 00
E. L. Bruck, Assistant in Medicine, Resident San Francisco Hospital		60 00
E. M. Carr, Assistant in Pediatrics, Resident University Hospital		60 00
Mary Casterline, Cafeteria, Southern Branch		60 00
T. H. Crook, Assistant, Geology and Mineralogy		60 00+
F. Holmes, Engineer, Hahnemann Hospital		60 00+
Ida C. Kenney, Office Assistant, Comptroller's Office		60 00
A. D. Laton, Assistant in Physiology		60 00
R. C. Martin, Assistant in Otology, Rhinology and Larynx, and Assistant Resident University Hospital		60 00
N. A. McCollom, Laborer, University Farm		60 00+
Delta R. Olsen, Assistant Physician for Women		60 00
Ida Poff, Cafeteria, Southern Branch		60 00
Edward Williamson, Ophthalmologist, Infirmary		60 00+
Anita Wolter, Clerk, University Hospital		60 00
Nina M. Alderton, Assistant in Mathematics		62 50
P. Byerly, Jr., Assistant in Physics		62 50
Gladys Campbell, Assistant, Mathematics		62 50+
L. Hill, Teaching Fellow in History		62 50
S. Maeser, Assistant in Chemistry		58 33
U. J. Marra, Teaching Fellow in History		62 50
A. K. Astor, Assistant in Physics		62 50
Evelyn Aylesworth, Assistant in Physics		62 50
W. C. Bartlett, Assistant in Economics		62 50
T. L. Bailey, Teaching Fellow in Geology		62 50
C. J. Bettin, General Helper in Shops, Wilmerding School		62 50
D. Bjork, Assistant in History		62 50
L. A. Bond, Teaching Fellow in Geology		62 50
G. C. Boyce, Teaching Fellow in History		62 50
R. C. Bridgman, Teaching Fellow in History		63 50
E. W. Brundin, Laboratory Assistant in Psychology		62 50
F. G. Burchett, Assistant in Economics		62 50
Dorothy Coker, Assistant in Botany		62 50
L. Cooper, Assistant in Economics		62 50
G. M. Cunningham, Assistant in Physics		62 50
H. L. Deimel, Assistant in Economics		62 50
Sarah Elkin, Teaching Fellow in Zoology		62 50
Joseph W. Ellis, Assistant in Physics		62 50
S. A. M. Francis, Assistant in Physics		62 50
N. S. Gallison, Assistant in Economics		62 50
A. F. Harshbarger, Teaching Fellow, Political Science		62 50
Josephine Hoyt, Teaching Fellow, Political Science		62 50
Jean Huddleston, Assistant in Physics		62 50
Edythe S. Katten, Assistant in Social Economics		62 50
J. F. Kessel, Teaching Fellow in Zoology		62 50
W. G. Kohner, Assistant in Botany		62 50
L. J. Lease, Assistant in Physics		62 50
F. F. Lenzen, Assistant in Physics		62 50
F. C. Leonard, Teaching Fellow in Astronomy		62 50
G. B. Maas, Assistant in Physics		62 50
W. H. Mah, Teaching Fellow in Political Science		62 50
U. J. Marra, Teaching Fellow, History		62 50
E. A. Martin, Teaching Fellow, Political Science		62 50
W. T. McGrath, Assistant in Economics		62 50
H. C. Mitchell, Assistant in History		62 50
N. P. Neilson, Assistant in Physics		62 50
J. F. Pobanz, Assistant in Mathematics		62 50+
Helen Rocca, Teaching Fellow, Political Science		62 50
Lucile Roush, Assistant in Botany		62 50

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
J. G. Schaffer, Assistant in Economics	62 50
E. B. Smith, Teaching Fellow, Political Science	62 50
H. E. Smith, Assistant in Economics	62 50
Helen H. Smith, Assistant in Physics	62 50
G. W. Smullin, Resident Assistant in Physics	62 50
H. G. Tasker, Assistant in Physics	62 50
M. M. Stockwell, Assistant in Economics	62 50
W. J. Tucker, Teaching Fellow in English	62 50
R. Vandergrift, Assistant in History	62 50
A. P. Vanselow, Assistant in Physics	62 50
B. H. Williams, Teaching Fellow, Political Science	62 50
B. C. Wong, Assistant in Mathematics	62 50
J. R. Sharpsteen, Resident Interne, Medical Education, University Hospital	64 00
L. M. K. Boelter, Assistant in Mechanics	65 00†
Ida Brasier, Cafeteria, Southern Branch	65 00
E. T. Brewster, Milk Route Salesman, University Farm	65 00†
Robert Brown, Helper, Dairy Sales, University Farm	65 00
Marion Culbertson, Tester, University Farm	65 00
Herbert Dellus, Helper, Dairy Sales, University Farm	65 00
Robert Gibson, Museum Guard, Anthropology	65 00
Nellie Housh, Cafeteria, Southern Branch	65 00
H. W. Hurry, Superintendent, Mailing Room	65 00†
Violet Monersen, Stenographer-Clerk, President's Office	65 00
Arthur Poyser, Museum Guard, Anthropology	65 00
Mary Rochford, Cafeteria, Southern Branch	65 00
Etna Sullivan, Cafeteria, Southern Branch	65 00
Florence Tedlock, Cafeteria, Southern Branch	65 00
F. P. Wisner, Student Fellow, Research Medicine, Hooper Foundation and Assistant Technician, Surgical Pathology, University Hospital	65 00
Murphy Young, Second Boy, Infirmary	65 00
T. F. Buehrer, Teaching Fellow, Chemistry	66 66
J. F. Forbes, Lecturer in Accounting	66 66†
Mildred Mihills, Teaching Fellow in English	66 66
T. E. Phipps, Teaching Fellow in Chemistry	66 66
Clyde F. Smith, Reader, upper division problems	67 00†
C. Middleton, X-Ray Assistant, Hahnemann Hospital	68 00†
Andrew Aitken, Laborer, University Farm	70 00†
Doris Alderson, Clerk, Infirmary	70 00
Geraldine Baroni, Junior Bookkeeper, Comptroller's Office	70 00
Gladys Basye, Pianist, Physical Education, Women	70 00
A. M. Brown, Maid, University Hospital	70 00
Annie Cassen, Seamstress, University Hospital	70 00
Helen Connolly, Office Apprentice, University Hospital	70 00
Eileen C. Duggan, Museum Helper, Anthropology	70 00
Henriette M. Flalon, Clerical Assistant, Library	70 00
Mary Finlayson, Seamstress, University Hospital	70 00
Elizabeth Hammond, Linen Room, University Hospital	70 00
Ethel Isaacs, Clerical Assistant, Library	70 00
James Kelley, Laborer, University Farm	70 00
Marie Kelly, Media Maker, Culture Media, University Hospital	70 00
Lucie A. Loud, Clerk, Infirmary	70 00
Elizabeth McIntyre, Maid, Culture Media, University Hospital	70 00
Clara Payne, Maid, Culture Media, University Hospital	70 00
N. Robinson, Maid, Hahnemann Hospital	70 00
William Service, Messenger, Medical School and Hospital and Comptroller's Office	70 00
Fannie Sheldon, Linen Room, University Hospital	70 00
Gladys Trosper, Office Apprentice, University Hospital	70 00
Laura Wright, Cafeteria, Southern Branch	70 00
Robert Van Zandt, Laborer, University Farm	70 00†
Rita Good, Maid, University Hospital, Clinical Laboratory	72 00
Nellie Mead, Maid, University Hospital, General Service	73 00
Ruth Adams, Clerk, University Extension	75 00
Mrs. J. Armstrong, Matron, Wheeler Hall	75 00
W. E. Bates, Lecturer, Hygiene, University Farm	75 00
Rosalind Blair, File Clerk, University Extension	75 00
Patricia Brown, Information Clerk, University Extension	75 00
Lucille Campbell, Index Clerk, Comptroller's Office	75 00
Katherine Carlton, Manager, Bureau of Occupations, Administration President's Office	75 00#
R. G. Challenger, Assistant Mechanical Engineer, Mechanics	75 00
O. S. Cook, Instructor in Roentgenology	75 00†
Belle Coombs, Helper, Agriculture	75 00
B. F. Dearing, Assistant, Pediatrics and Resident University Hospital	75 00
C. Dewfield, Laborer, University Farm	75 00
H. D. Draper, Teaching Fellow, Chemistry	75 00
F. W. Epley, Instructor, Radiography and Orthodontia, Dentistry	75 00†
Mrs. H. C. Ferrer, Matron, Dentistry	75 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Hugh Forgie, Animal Caretaker, Pathology, University Hospital	75 00
B. M. Glantz, Associate, Industrial Arts, Southern Branch	75 00
Florence Goddard, Instructor, Industrial Arts, Southern Branch	75 00
Burdette Gray, Stenographer, University Extension	75 00
J. W. Gustin, Laborer, University Farm	75 00
Grace E. Hardy, Stenographer, Los Angeles University Extension	75 00
E. B. Hart, Stenographer, Los Angeles Medical	75 00
C. Hemphill, Laborer, University Farm	75 00
T. R. Hogness, Teaching Fellow, Chemistry	75 00
Mary E. Hutton, Assistant Matron, Gymnasium	75 00
Hazel Drake Jackson, Associate in Industrial Arts, Southern Branch	75 00
A. W. Johnson, Instructor, Otology, Rhinology and Laryngology	75 00†
Mrs. E. Kenna, Janitress, Hearst Hall	75 00
H. S. King, Chimes Master, Campanile Maintenance	75 00
Jacob H. Kropp, Assistant Armorer, Military Science and Tactics	75 00
Bernice Kronnick, Requisition Clerk, Comptroller's Office	75 00
Ruth Knapp, Clerk, Culture Media, University Hospital	75 00
Almee Laumen, Cashier, University Hospital, Out Patient Department	75 00
J. Lee, Laborer, University Farm	75 00
W. E. Leland, Lecturer, Architectural Mechanics	75 00
Freda Linne, Assistant Bookkeeper, University Hospital	75 00
Florence Macmillan, Technician, Surgical Pathology, University Hospital	75 00
M. L. Montgomery, Assistant in Anatomy	75 00
Mrs. H. S. Moose, Janitress	75 00
Beulah M. Morrison, Research Assistant, Psychology	75 00
L. F. Morrison, Assistant in Bacteriology	75 00
D. Muray, Laborer, University Farm	75 00
N. Naka, Animal Caretaker, Anatomy, University Hospital	75 00
Hazel Niehaus, Typist, Printing Office	75 00
J. Patigan, Laborer, University Farm	75 00
C. Dorothea Phillips, Assistant, Industrial Arts, Southern Branch	75 00
M. A. Phinney, Mailing Clerk, Agriculture	75 00†
Joseph Posner, Assistant, Publications, Publicity Assistant, President's Office	75 00
M. Ranuro, Laborer, University Farm	75 00
E. Rawson, Laborer, University Farm	75 00
Bernice Rhodes, Technician, Pathology, University Hospital	75 00
G. K. Rhodes, Instructor, Surgery, Medical School and Hospitals	75 00†
T. Richie, Laborer, University Farm	75 00
J. Rowe, Laborer, University Farm	75 00†
H. H. Searls, Assistant in Surgery and Resident, University Hospital	75 00
A. A. Shufelt, Assistant, Obstetrics and Gynecology and Resident University Hospital	75 00
J. Sims, Laborer, University Farm	75 00
B. Smith, Laborer, University Farm	75 00
C. Smith, Laborer, University Farm	75 00
M. Spangler, Laborer, University Farm	75 00
Helen Speck, Assistant to Counselor, Southern Branch	75 00
Helen Stanfors, Clerk and Stenographer, University Hospital	75 00
Frances E. Steiner, Voucher Record Clerk, Comptroller's Office	75 00
N. Stewart, Telephone Operator, Hahnemann Hospital	75 00
Mary Stiefvater, Technician, Surgical Pathology, University Hospital	75 00
P. M. Stone, Stenographer, Agriculture	75 00†
Katherine Stout, Clerk, University Extension	75 00
Florence Sutton, Assistant, Tennis, Southern Branch	75 00
C. R. Swanstrom, Assistant Armorer, Military Science and Tactics	75 00
Harriet Tindall, Cafeteria, Southern Branch	75 00
Annie Von Schritzt, Cafeteria, Southern Branch	75 00
Viola Warren, Assistant Secretary, General Medicine, University Hospital	75 00
Florence I. Wendering, Clerical Assistant, Library	75 00
G. Wickson, Instructor, Graphic Art	75 00
Byna Williamson, Stenciler, University Extension	75 00
Alice Winchester, Secretary, X-Ray, University Hospital	75 00
Mildred Winchester, Stenographer-Clerk, Physio-education, Women	75 00†
H. H. Woodruff, Janitor, Philosophy	75 00
Agnes Zachert, Clerk, Infirmary Service, University Hospital	75 00
Catherine Zachert, Clerk, University Hospital	75 00
Martha Olsson, Assistant Technician, Physio-Therapy, University Hospital	75 50†
\$1.00 to \$50.00.	
Elizabeth Armstrong, Helper, Monitor, Philosophy	†\$0 62½
Elsie Barth, Helper, Monitor, Philosophy	†62½
Florence Graves, Helper, Monitor, Philosophy	†62½
Ramona Ferrari, Helper, Monitor, Philosophy	†62½
Ruth Hawkins, Helper, Monitor, Philosophy	†62½

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Dorothy Hopkins, Helper, Monitor, Philosophy	1623
Koren Kieldsen, Helper, Monitor, Philosophy	1623
Dorothy Meyer, Helper, Monitor, Philosophy	1623
Julia Neales, Helper, Monitor, Philosophy	1623
J. E. Law, Curator in Osteology (Museum)	1 00
L. C. Merriam, Reader in Surveying	3 25+
N. C. Raab, Reader in Surveying	3 50+
W. Whitehead, Morgue Keeper, University Hospital, San Francisco City and County Hospital	5 00+
H. W. Haberkorn, Reader in Surveying	5 25+
Virginia Henning, Reader, Philosophy	7 00+
Mrs. M. D. Bishop, Reader, Education	7 20+
Clifford Runte, Laboratory Assistant, Scripps Institute	7 50+
L. Bartlett, Lecturer in Dental Jurisprudence, Dentistry	8 33+
E. C. Bettencourt, Clinical Instructor in Prosthetic Dentistry	8 33+
J. L. Campbell, Instructor in Operative Dentistry	8 33+
A. M. Church, Clinical Instructor in Operative Dentistry	8 33+
H. O. Eggert, Clinical Instructor in Operative Dentistry	8 33+
Norma Gould, Assistant in Gymnastics, Southern Branch	8 33
O. A. Haberdier, Clinical Instructor in Prosthetic Dentistry	8 33+
Glen Haydon, Assistant, Music	8 33+
F. O. Hoedt, Clinical Instructor in Operative Dentistry	8 33+
C. W. Johnson, Instructor in Operative Dentistry	8 33+
W. H. Lowell, Clinical Instructor in Operative Dentistry	8 33+
L. Schuchard, Instructor in Extracting, Dentistry	8 33+
T. R. Sweet, Instructor in Orthodontics, Dentistry	8 33+
John P. Daley, Reader in Surveying	9 00+
Valerie Arnold, Reader, Philosophy	10 00+
Lee Barker, Assistant, Military Science and Tactics	10 00+
Ruth E. Baugh, Assistant, Geography	10 00+
W. Beckett, Assistant Chimes Master, Campanile Maintenance	10 00+
Benjamin Benas, Reader in Surveying	10 00+
Wm. J. Blythe, Assistant to Professor, Military Science and Tactics	10 00+
G. W. Marvin, Reader in Surveying	10 00+
Vera Morse, Assistant, Public Speaking	10 00+
Margery Mower, Reader, Philosophy	10 00+
Christian Ploss, Assistant Military Science and Tactics	10 00+
Oscar Rosendorf, Assistant Military Science and Tactics	10 00+
Merton Slater, Student Laborer, University Farm	10 00+
J. R. Thompson, Assistant Military Science and Tactics	10 00+
W. White, Laboratory Assistant, Scripps Institute	10 00+
Carl Mungersdarf, Assistant Physical Education, Southern Branch	10 41+
L. Jenks, Reader, Philosophy	11 33+
E. P. Griffin, Assistant Librarian, Dentistry	12 50+
R. Hunter, Lecturer in Economics and English	12 50+
A. W. Jacobs, Observer Meteor Station, Geography	12 50+
T. W. Sharp, Reader, Latin	12 50+
C. A. Brown, Reader, Education	14 40+
Jessie Jackson, Reader, Education	14 40+
Margaret E. Martin, Reader, Education	14 40+
F. J. Adams, Assistant Psychology Research	15 00+
Louise Alexander, Teacher, Southern Branch	15 00+
Florence Alvarez, Teacher, Southern Branch	15 00+
Ella Lynch Ashton, Teacher, Southern Branch	15 00+
Sadie E. Black, Teacher, Southern Branch	15 00+
Estelle Mary Brown, Teacher, Southern Branch	15 00+
B. E. Garner, Laboratory Assistant, Scripps Institute	15 00+
Alberta Gatton, Reader, Philosophy	15 00+
Pauline Hilleman, Reader, Greek	15 00+
Antonino LoPrest, Reader in Surveying	15 00+
Eberta McKechnie, Attendant, History	15 00+
Elizabeth McPeak, Teacher, Southern Branch	15 00+
J. Miller, Office Boy, President's Office	15 00+
Frances Phillips, Teacher, Southern Branch	15 00+
R. E. Pollich, Teacher, Southern Branch	15 00+
Nellie I. Potter, Principal, Southern Branch	15 00+
Mary C. Rupp, Teacher, Southern Branch	15 00+
Ellen L. Toy, Teacher, Southern Branch	15 00+
Emma Weberg, Teacher, Southern Branch	15 00+
H. J. Bruhns, Clinical Instructor in Operative Dentistry	16 66+
T. Craig, Clinical Instructor in Operative Dentistry	16 66+
J. E. Gurley, Instructor in Inorganic Chemistry Dentistry	16 66+
H. T. Moore, Lecturer in Surgery, Dentistry	16 66+
C. B. Musante, Clinical Instructor in Operative Dentistry	16 66+
G. Schneider, Lecturer, Physical Education, Men	E16 66+
A. E. Scott, Instructor in Orthodontia, Dentistry	16 66+
S. B. Scott, Instructor in Dental Porcelain	16 66+

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
J. E. Steffan, Clinical Instructor in Operative Dentistry	16 66½
S. A. White, Clinical Instructor in Operative Dentistry	16 66½
W. C. Wright, Instructor in Dental Porcelain	16 66½
Fondalita Lowry, Reader, Latin	18 75½
Gertrude Allen, Superintendent of the Teacher's Course in Mathematics, University High School	20 00
Florence Bathgate, Reader, Philosophy	20 00½
Frances Farmer, Reader, English	20 00½
C. Hogan, Laborer, University Farm	20 03½
Alan Hurd, Reader, English	20 00½
C. M. Jones, Messenger, President's Office	20 00½
A. Murphy, Reader, Philosophy	20 00½
Helen Price, Supervisor of the Teachers' Course in Library Service, University High School	20 00
Henriette Roumigier, Reader, Philosophy	20 00½
Madelaine Schreiber, Reader, English	20 00½
G. B. Wallace, Office Manager, Stock, University Extension	20 83
C. C. Conrad, Superintendent of the Teaching of Latin, University High School	20 83
T. P. Knudson, Reader, Education	21 60½
J. C. Alter, Assistant in Chemical Department	25 03½
Y. Amagata, Reader, Mathematics	25 00½
Nellie Bartlett, Reader, Mathematics	25 00½
Clifford Bell, Reader, Mathematics	25 00½
Mrs. S. Bogue, Janitress, Botulism Investigations	25 00½
Ruth Brant, Reader, Mathematics	25 00½
W. M. Braun, Reader, Mathematics	25 00½
E. C. Bull, Assistant in Orthopedic Surgery	25 00½
Lois Carroll, Assistant in Chemical Department	25 00½
Katherine Close, Lecturer in Hygiene, Southern Branch	25 00
Mamie Cohen, Reader, Mathematics	25 00½
M. L. Cohn, Assistant in Pediatrics	25 00½
Christine Cothran, Clerk, Astronomy	25 00½
D. D. Crystal, Reader, History	25 00½
R. V. Custer, Reader, History	25 00½
R. V. Douglas, Assistant in Chemistry, Southern Branch	25 00
E. S. DuBay, Assistant in Medicine	25 00½
H. Farrington, Assistant in Chemical Department	25 00½
C. B. Fowler, Assistant in Surgery and House Officer San Francisco Hospital	25 00
M. L. Frandy, Assistant in Obstetrics and Gynecology and House Officer in San Francisco Hospital	25 00
Martha Gallagher, Los Angeles, Medical	25 00½
Otto George, Reader, History	25 00
Mabel F. Gifford, Assistant in Neuropsychiatry	25 00½
R. P. Giovannetti, Assistant in Orthopedic Surgery	25 00½
Bentrice Goldman, Reader, History	25 00½
Arda Green, Assistant in Chemical Department	25 00½
Metta Clara Green, Assistant in Chemical Department	25 00½
Florence Guppy, Reader, Music	25 00½
G. P. Hammond, Reader, History	25 00½
W. H. Hanford, Instructor in Extracting and Prophylaxis, Dentistry	25 00½
Edna Hansen, Assistant in Chemistry Department	25 00½
Ruth A. Hardy, Reader, History	25 00½
L. A. Harper, Reader, History	25 00½
Frances Hesse, Reader, Mathematics	25 00½
R. G. Hiscox, Reader, Mathematics	25 00½
Mildred Hurd, Reader, Mathematics	25 00½
Eugene Joralemon, Library Assistant in Romance, Spanish	25 00½
Constance Kendall, Reader, Mathematics	25 00½
Dorothea Kerr, Reader, Mathematics	25 00½
R. E. Keys, Librarian, Dentistry	25 00½
Frieda L. Kruse, Assistant in Pediatrics	25 00½
Cora P. McKay, Assistant Supervisor of English, University High School	25 00½
A. E. Meyers, Instructor in Pediatrics	25 00½
Mary E. Millard, Reader, Music	25 00½
O. K. Mohs, Assistant in Surgery and Assistant Resident, University Hospital	25 00
J. B. Pardoe, Assistant in Medicine and House Officer, San Francisco Hospital	25 00
Miriam Parker, Assistant in Chemical Department	25 00½
L. D. Prince, Assistant in Orthopedic Surgery	25 00½
A. C. Rulofson, Instructor in Anesthesia, Dentistry	25 00½
Lucia B. Mirrieles, Assistant Supervisor of English, University High School	25 00½
Sadie Rainey, Nurse, Medical (Los Angeles)	25 00½
L. Reimers, Reader, Mathematics	25 00½
J. Sherman, Assistant in Medicine	25 00½
E. W. Simmons, Assistant in Medicine and House Officer San Francisco Hospital	25 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Leo Steck, Assistant in Chemistry Department	25 00†
Bekke R. Steward, Reader, History	25 00†
Vera Stump, Reader, History	25 00†
Jeannette M. Sudow, Reader, History	25 00†
M. J. Tobin, Senior Bookkeeper	25 00†
Katherine Towle, Reader, History	25 00†
Florence Wolf, Nurse, Los Angeles Medical	25 00†
Lester Browning, Evening Clerk, University Hospital	26 00†
H. A. Black, Reader and Assistant, Jurisprudence	30 00†
W. A. Brewer, Reader, English	30 00†
Grace Dupuy, Teacher, Southern Branch	30 00†
Marjorie Hughes, Clerk, Southern Branch	30 00†
Clara Kemerle, Refractionist, Los Angeles, Medical	30 00†
Mrs. M. Kendricks, Matron, University High School	30 00†
C. Kruger, Reader, Mathematics	30 00†
Phillip S. Mathews, Reader and Assistant, Jurisprudence	30 00†
Mrs. Mary Rewcastle, Stenographer, President's Office	30 00†
F. Tapscott, Clerk (part time), University Extension	30 00†
Pearl Brown, Pupil Nurse, Hahnemann Hospital	31 00
C. Christianson, Pupil Nurse, Hahnemann Hospital	31 00
H. E. Crooks, Pupil Nurse, Hahnemann Hospital	31 00
M. Eaton, Pupil Nurse, Hahnemann Hospital	31 00
E. Erickson, Pupil Nurse, Hahnemann Hospital	31 00
Hm. Hammond, Pupil Nurse, Hahnemann Hospital	31 00
E. Harper, Pupil Nurse, Hahnemann Hospital	31 00
A. O. Koch, Pupil Nurse, Hahnemann Hospital	31 00
M. Lambert, Pupil Nurse, Hahnemann Hospital	31 00
I. E. Mabring, Pupil Nurse, Hahnemann Hospital	31 00
M. E. McNealy, Pupil Nurse, Hahnemann Hospital	31 00
I. E. Spittler, Pupil Nurse, Hahnemann Hospital	31 00
E. E. Stanton, Pupil Nurse, Hahnemann Hospital	31 00
M. F. Stimmel, Pupil Nurse, Hahnemann Hospital	31 00
L. R. Hafen, Teaching Fellow in History	31 25
J. G. Johnson, Teaching Fellow in History	31 25
R. E. Berry, Assistant in Accounting	33 33
N. E. Fiske, Assistant Professor, Military Science and Tactics	33 33‡
Chas. M. Jones, Clerical Assistant, Library	33 33†
P. E. Peabody, Assistant Professor, Military Science and Tactics	33 33‡
G. W. Simonton, Instructor in Physiology, Dentistry	33 33†
L. K. Underhill, Assistant Professor of Military Science and Tactics	33 33‡
Mrs. F. E. Perham, Reader, English	35 00†
Lillian Watson, Clerk, Physics	35 00†
George Collier, Bus Boy, University Hospital	36 00†
Charles G. Haw, Bus Boy, University Hospital	36 00†
C. B. Pattee, Bus Boy, University Hospital	36 00†
Edward A. Reinke, Reader, Upper Division Problems	36 00†
H. Shelton, Bus Boy, University Hospital	36 00†
Chris Stabler, Bus Boy, University Hospital	36 00†
Nelle B. Bates, Caretaker, Berkeley	40 00
C. C. Berwick, Resident Interne, Medical Education, University Hospital	40 00
John C. Dement, Resident Interne, Medical Education, University Hospital	40 00
Margaret Geary, Stenographer for Professor Hildebrand, Chemistry	40 00†
Florence Hallan, Manager Cafeteria, Southern Branch	40 00†
G. C. Iki, Resident Interne, Medical Education, University Hospital	40 00
J. S. McManus, Instructor, Southern Branch	40 00†
H. Olsen, Instructor, Southern Branch	40 00†
Helen Sinnott, Stenographer, Dentistry Research	40 00†
C. V. Thompson, Resident Interne, Medical Education, University Hospital	40 00
Elva Williams, Typist, Comptroller's Office, Assistant	40 00†
W. A. Gregory, Resident Interne, Medical Education, University Hospital	40 67
Chas. F. Keith, Resident Interne, Medical Education, University Hospital	40 67
John J. Kingston, Resident Interne, Medical Education, University Hospital	40 67
Helen Brock, Clerk, Southern Branch	41 66
Lova Holt, Assistant in Zoology	41 66
M. F. McComb, Lecturer in Business Law, Southern Branch	41 66
P. S. Taylor, Assistant in Economics	41 66
H. S. Hoyt, Resident Interne, Medical Education, University Hospital	42 00
Dexter R. Ball, Resident Interne, Medical Education, University Hospital	45 00
M. Huzo Childress, Resident Interne, Medical Education, University Hospital	45 00
Zach B. Coblenz, Resident Interne, Medical Education, University Hospital	45 00
L. F. Foster, Assistant Supervisor of Science, University High School	45 00
Ruth G. Hamilton, Stenographer, Household Science	45 00†
Hal Rexford Hoobler, Resident Interne, Medical Education, University Hospital	45 00
D. E. Jeffry, Resident Interne, Medical Education, University Hospital	45 00
Dr. Y. F. Kitsuda, Interne, Hahnemann Hospital	45 00
Katherine Oman, Technician, University Hospital, Clinical Laboratory	45 00†
Michael Radzville, Chief Clerk, Military Science and Tactics	45 00†

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
R. G. Scribner, Resident Intern, Medical Education, University Hospital	45 00
Frederick P. Shafer, Resident Intern, Medical Education, University Hospital	45 00
Edward B. Shaw, Resident Intern, Medical Education, University Hospital	45 00
Grace Adams, Pupil Nurse, University Hospital	47 00
Elizabeth Adsit, Pupil Nurse, University Hospital	47 00
Mary Allen, Pupil Nurse, University Hospital	47 00
Bernice Anthony, Pupil Nurse, University Hospital	47 00
Helen Austin, Pupil Nurse, University Hospital	47 00
Azelia Baratini, Pupil Nurse, University Hospital	47 00
Bertha Beard, Pupil Nurse, University Hospital	47 00
Phyllis Beckwith, Pupil Nurse, University Hospital	47 00
Anna Beutel, Pupil Nurse, University Hospital	47 00
Wangeline Break, Pupil Nurse, University Hospital	47 00
Lolita Brewer, Pupil Nurse, University Hospital	47 00
Mabel Brin, Pupil Nurse, University Hospital	47 00
Lena Buck, Pupil Nurse, University Hospital	47 00
Avis Burchard, Pupil Nurse, University Hospital	47 00
Dorothy Carey, Pupil Nurse, University Hospital	47 00
Eugenia Carneiro, Pupil Nurse, University Hospital	47 00
Helen Carragher, Pupil Nurse, University Hospital	47 00
Imogene Cheney, Pupil Nurse, University Hospital	47 00
Kathryn Chestnutt, Pupil Nurse, University Hospital	47 00
Virginia Ciarlo, Pupil Nurse, University Hospital	47 00
Ruth Coleman, Pupil Nurse, University Hospital	47 00
Dorothy Conrad, Pupil Nurse, University Hospital	47 00
Selene Cook, Pupil Nurse, University Hospital	47 00
Alice Coughlin, Pupil Nurse, University Hospital	47 00
Dorothy Crane, Pupil Nurse, University Hospital	47 00
Ethel Dietrich, Pupil Nurse, University Hospital	47 00
Beatrice Drysdale, Pupil Nurse, University Hospital	47 00
Dorothy Drysdale, Pupil Nurse, University Hospital	47 00
Mary Fitzgerald, Pupil Nurse, University Hospital	47 00
Helen Fulek, Pupil Nurse, University Hospital	47 00
Genevieve Fairwell, Pupil Nurse, University Hospital	47 00
Harriet Foster, Pupil Nurse, University Hospital	47 00
Florence Ford, Pupil Nurse, University Hospital	47 00
Alice Fuhring, Pupil Nurse, University Hospital	47 00
Florence Gamble, Pupil Nurse, University Hospital	47 00
Ruth Glass, Pupil Nurse, University Hospital	47 00
Julia Grasmoen, Pupil Nurse, University Hospital	47 00
Pauline Gray, Pupil Nurse, University Hospital	47 00
Kathleen Hales, Pupil Nurse, University Hospital	47 00
Rebecca Hammond, Pupil Nurse, University Hospital	47 00
Emilie Hansen, Pupil Nurse, University Hospital	47 00
Constance Heaton, Pupil Nurse, University Hospital	47 00
Delpha Heaton, Pupil Nurse, University Hospital	47 00
Dorothy Hess, Pupil Nurse, University Hospital	47 00
Esther Holman, Pupil Nurse, University Hospital	47 00
Marjorie Huxley, Pupil Nurse, University Hospital	47 00
Elizabeth Hyatt, Pupil Nurse, University Hospital	47 00
Margaret Illig, Pupil Nurse, University Hospital	47 00
Martha Jaehrig, Pupil Nurse, University Hospital	47 00
Elizabeth James, Pupil Nurse, University Hospital	47 00
Ina Jensen, Pupil Nurse, University Hospital	47 00
Ella Johnson, Pupil Nurse, University Hospital	47 00
Julia Jenkins, Pupil Nurse, University Hospital	47 00
Lila Kellogg, Pupil Nurse, University Hospital	47 00
Rosemary Kobes, Pupil Nurse, University Hospital	47 00
Grayce Krantz, Pupil Nurse, University Hospital	47 00
Rose Luderemann, Pupil Nurse, University Hospital	47 00
Edith Madeley, Pupil Nurse, University Hospital	47 00
Almeda MacKenzie, Pupil Nurse, University Hospital	47 00
Dorothea Madsen, Pupil Nurse, University Hospital	47 00
Leila McDonald, Pupil Nurse, University Hospital	47 00
Emily Mitchell, Pupil Nurse, University Hospital	47 00
Gladys Molbeck, Pupil Nurse, University Hospital	47 00
Helen Myles, Pupil Nurse, University Hospital	47 00
Regina Nelson, Pupil Nurse, University Hospital	47 00
Jeanne Normand, Pupil Nurse, University Hospital	47 00
Mary O'Halloran, Pupil Nurse, University Hospital	47 00
Dorothy Orr, Pupil Nurse, University Hospital	47 00
Mary Pannell, Pupil Nurse, University Hospital	47 00
Marguerite Peck, Pupil Nurse, University Hospital	47 00
Lillian Phillips, Pupil Nurse, University Hospital	47 00
Rebecca Phillips, Pupil Nurse, University Hospital	47 00
Katherine Podraski, Pupil Nurse, University Hospital	47 00
Gertrude Rasmussen, Pupil Nurse, University Hospital	47 00
Beulah Rice, Pupil Nurse, University Hospital	47 00
Mary Roberts, Pupil Nurse, University Hospital	47 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Bertha Rodgers, Pupil Nurse, University Hospital	47 00
Lucille Rosenthal, Pupil Nurse, University Hospital	47 00
Bathia Ross, Pupil Nurse, University Hospital	47 00
Mary Ross, Pupil Nurse, University Hospital	47 00
Isabel Rugg, Pupil Nurse, University Hospital	47 00
Mildred Russell, Pupil Nurse, University Hospital	47 00
Sylvia Sabin, Pupil Nurse, University Hospital	47 00
Alma Sauer, Pupil Nurse, University Hospital	47 00
Emily Segesman, Pupil Nurse, University Hospital	47 00
Lucy Skelton, Pupil Nurse, University Hospital	47 00
Jennie Smith, Pupil Nurse, University Hospital	47 00
Edna Snyder, Pupil Nurse, University Hospital	47 00
Daisy Stephens, Pupil Nurse, University Hospital	47 00
Eleanor Stillings, Pupil Nurse, University Hospital	47 00
Florence Styles, Pupil Nurse, University Hospital	47 00
Julia Sundt, Pupil Nurse, University Hospital	47 00
Bernice Thompson, Pupil Nurse, University Hospital	47 00
Glady's Thompson, Pupil Nurse, University Hospital	47 00
Myrl Thompson, Pupil Nurse, University Hospital	47 00
Ilermia Van Gorkum, Pupil Nurse, University Hospital	47 00
Violet Vernon, Pupil Nurse, University Hospital	47 00
Eleanor Westendorf, Pupil Nurse, University Hospital	47 00
Grace Whittet, Pupil Nurse, University Hospital	47 00
Ruth Williams, Pupil Nurse, University Hospital	47 00
Dorothy Wintler, Pupil Nurse, University Hospital	47 00
Ruth Woosley, Pupil Nurse, University Hospital	47 00
Marie Yeaton, Pupil Nurse, University Hospital	47 00
Alice Yelland, Pupil Nurse, University Hospital	47 00
Esther Young, Pupil Nurse, University Hospital	47 00
H. H. Alvarez, Instructor in Extracting	50 00†
J. A. Almquist, Assistant in Chemistry	50 00
Lily Anderson, Relief Telephone Operator, Telephone	50 00†
Aileen Andrews, Teaching Fellow in Zoology	50 00
Mrs. E. W. Bailey, Clerk in San Diego	50 00†
Elizabeth G. Balderston, Teaching Fellow in English	50 00
E. Barnhart, Lecturer in Education	50 00†
Dr. P. P. Baron, Interne Hahneman Hospital	50 00
Ruth E. Baugh, Teaching Fellow, Geography	50 00
E. J. Best, Instructor in Medicine	50 00†
E. Bishop, Assistant in Chemistry	50 00
Doris Bockius, Assistant in Household Science	50 00
W. Boericke, Clinical Professor of Homeopathic Medicine	50 00†
C. J. Booth, Superintendent Practice Teaching, Smith Hughes Agriculture	50 00†
Edna M. Boyd, Stenographer, Agriculture	50 00†
L. H. Briggs, Instructor in Medicine	50 00†
Edith Bronson, Assistant in Pediatrics	50 00†
B. M. Burehfel, Assistant in Chemistry	50 00
Emily B. Carrier, Student Fellow, Research Medicine	50 00
H. H. Clewett, Student Laborer, University Farm	50 00†
F. C. Cordes, Assistant in Ophthalmology	50 00†
Mrs. O. D. Cowan, Assistant Secretary General Surgery, University Hospital	50 00†
L. E. Cowles, Teaching Fellow in Vocational Education	50 00
C. Crane, Teaching Fellow in English	50 00
Charmian Crittenden, Assistant in Sanskrit	50 00
Edith Cummings, Fellow in Lick Observatory	50 00
E. J. Cuy, Assistant in Chemistry	50 00
P. S. Danner, Assistant in Chemistry	50 00
L. P. Del Sasso, Assistant in Physics, Southern Branch	50 00
Paul Dorn, Assistant in Chemistry Department	50 00†
H. L. Eby, Teaching Fellow in Rural Education	50 00
J. D. Flder, Assistant in Physics, Southern Branch	50 00
A. L. Elliott, Assistant in Chemistry	50 00
C. O. Esterly, Zoologist, Biological Research	50 00
R. M. Evans, Assistant in Chemistry	50 00
Priscilla Farifield, Fellow in Lick Observatory	50 00
E. H. Falconer, Instructor in Medicine	50 00†
Ida Fellows, Librarian, Los Angeles Medical	50 00†
Elizabeth V. Ferguson, Assistant in Botany	50 00
Lucy Freeland, Research Fellow in Anthropology	50 00
W. C. Fray, Instructor in Medicine	50 00†
A. H. French, Assistant in Chemical Department	50 00†
R. C. Fuson, Assistant in Chemistry	50 00
C. A. Glover, Assistant in Accounting	50 00
Katherine M. Groesbeck, Teacher Fellow of Anthropology	50 00
L. Gunther, Assistant in Chemistry, Southern Branch	50 00
H. H. Heller, Research Work, Hooper Foundation	50 00†
H. H. Hitchcock, Assistant in Orthopedic Surgery	50 00†

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Monthly Salary
Mildred Hollis, Assistant in Botany.....	50 00
Wm. M. Hoskins, Assistant in Chemistry.....	50 00
Vera L. Hughes, Teaching Fellow, Anthropology.....	50 00
Margaret Kelley, Office Assistant, Smith Hughes.....	50 00
A. R. Kilgore, Instructor in Surgery.....	50 00+
E. S. Kilgore, Assistant Clinical Professor of Medicine.....	50 00+
H. A. R. Kreutzmann, Assistant in Urology.....	50 00+
F. H. Kruse, Instructor in Medicine.....	50 00+
H. M. Jeffers, Fellow in Lick Observatory.....	50 00
C. A. Jenks, Assistant in Chemistry.....	50 00
Marie Krause, Technician, University Hospital.....	50 00+
Florence LaGanke, Supervisor of the Teaching of Household Economics, University High School.....	50 00
L. Langstroth, Instructor in Medicine.....	50 00+
F. W. Lee, Student Fellow, Research Medicine.....	50 00
H. Lisser, Instructor in Medicine.....	50 00+
N. M. Lonn, Dental Surgeon, Infirmary.....	50 00
Dolly C. Lutjeharms, Assistant in Botany.....	50 00
Pauline Lynch, Assistant in Home Economics, Southern Branch.....	50 00
L. S. Mace, Instructor in Medicine.....	50 00+
L. W. Marshall, Instructor in Crown and Bridge Work, Dentistry.....	50 00+
H. A. Mazzer, Teaching Fellow in Public Speaking.....	50 00
H. McClanahan, Assistant in Commerce, Southern Branch.....	50 00
H. McCrane, Assistant in Chemistry, Southern Branch.....	50 00
H. T. Mercer, Teaching Fellow in English.....	50 00
H. E. Miller, Instructor in Dermatology.....	50 00+
Ottile Miller, Assistant in Biology, Dentistry.....	50 00+
R. C. Miller, Teaching Fellow in Zoology.....	50 00
Elizabeth A. Murphy, Technician, Department of Anatomy, University Hospital.....	50 00+
Katherine Noble, Technical Assistant, University Hospital, Department of Anatomy.....	50 00+
Leila Noland, Teaching Fellow in English.....	50 00
S. Olsen, Assistant in Urology.....	50 00+
Katherine Oman, Bacteriologist, Botulism Investigation.....	50 00
Mrs. M. F. Parten, Clerk, Out Patient Department, University Hospital.....	50 00
Dr. Max Peck, Dental Extern, University Hospital.....	50 00+
K. F. Pelkan, Student Fellow, Research Medicine.....	50 00
F. E. Perham, Instructor in English, Dentistry.....	50 00+
L. H. Peterson, Teaching Fellow in Education.....	50 00
L. M. Piccirillo, Assistant, Italian.....	50 00+
Orlando Piro, Office Boy, Agriculture.....	50 00
L. P. Player, Instructor in Urology.....	50 00+
W. D. Ramage, Assistant in Chemistry.....	50 00
Samuel Randall, Media Maker, Pathology, University Hospital.....	50 00+
W. H. Randall, Clerk, Undergraduate Division.....	50 00+
Helen Redfield, Teaching Fellow in Zoology.....	50 00
J. M. Rehfsch, Instructor in Medicine.....	50 00+
Eva C. Reid, Instructor in Psychiatry.....	50 00+
Ina Richter, Assistant in Medicine.....	50 00+
H. E. Ridenour, Instructor in Prosthetic Dentistry.....	50 00
Esther Rosenberantz, Instructor in Medicine.....	50 00+
R. J. Russell, Teaching Fellow, Geography.....	50 00
J. C. Scott, Teaching Fellow of Anthropology.....	50 00
R. M. Selle, Teaching Fellow in Zoology.....	50 00
J. F. Schermerhorn, Assistant in Pediatrics.....	50 00+
A. M. Shaffer, Assistant in Chemistry.....	50 00
Rose I. Shere, Secretary, University Hospital, Department of Physiology.....	50 00+
R. K. Spaulding, Assistant in Spanish.....	50 00+
C. C. Staehling, Lecturer in Accounting.....	50 00+
M. W. Stirling, Teaching Fellow of Anthropology.....	50 00
N. W. Taylor, Assistant in Chemistry.....	50 00
Martha Thompson, Teaching Fellow in Zoology.....	50 00
H. S. Thomson, Instructor in Surgery.....	50 00+
C. O. Tufts, Instructor in Roentgenology.....	50 00+
M. Tufts, Driver, University Farm.....	50 00+
R. Vandervoort, Teaching Fellow in Public Speaking.....	50 00
Jean Walker, Assistant in Abnormal Psychology.....	50 00
C. E. Walton, Teaching Fellow in Zoology.....	50 00
Fda L. Walton, Teaching Fellow in English.....	50 00
Chas. F. We'd, Janitor Service.....	50 00+
F. J. Weng, Teaching Fellow in English.....	50 00
C. Westbay, Instructor in Operative Dentistry.....	50 00+
Gladye White, Class Technician, University Hospital, Department of Anatomy.....	50 00+
J. L. Whitney, Assistant Clinical Professor of Medicine.....	50 00+
A. M. Williams, Assistant in Chemistry.....	50 00
P. T. Wilson, Assistant in Botany.....	50 00
T. F. Young, Assistant in Chemistry.....	50 00
C. Zampetini, Instructor in Operative Dentistry.....	50 00+
Frieda Ziegler, Assistant in German.....	50 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Weekly Salary
Wm. H. Duffon, Chief Engineer, University Hospital.....	58 31
John Shepherd, Subsistence, Chef, University Hospital.....	55 52
George Johnson, Foreman Laundry, University Hospital.....	47 84
Frank Williams, Electrician, University Hospital.....	43 19
Mrs. S. Bogue, Dishwasher, University Hospital.....	10 50 1
G. Helms, Chef, Hahnemann Hospital.....	40 52
Louis Hufford, Engineer, University Hospital.....	38 50
Edward Murphy, Engineer, University Hospital.....	38 34
J. W. Schultz, Engineer, University Hospital.....	38 34
C. E. Welch, Engineer, University Hospital.....	38 34
Alex Davie, Subsistence, University Hospital.....	38 19
W. Relich, Second Cook, Hahnemann Hospital.....	38 02
Emile Bambon, Subsistence Second Cook, Hahnemann Hospital.....	38 02
M. Abelgas, Night Nurse, Hahnemann Hospital.....	37 21
A. Algiers, General Nurse, Hahnemann Hospital.....	37 21
E. Battock, Night Nurse, Hahnemann Hospital.....	37 21
R. Bernhardt, Supervisor, Hahnemann Hospital.....	37 21
M. Collins, Night Nurse, Hahnemann Hospital.....	37 21
H. Conover, General Nurse, Hahnemann Hospital.....	37 21
C. A. Crane, General Nurse, Hahnemann Hospital.....	37 21
A. DeGraff, Night Nurse, Hahnemann Hospital.....	37 21
T. Dolan, Floor Nurse, Hahnemann Hospital.....	37 21
E. F. Harris, General Nurse, Hahnemann Hospital.....	37 21
M. Hasseur, General Nurse, Hahnemann Hospital.....	37 21
E. M. Joyce, Supervisor, Hahnemann Hospital.....	37 21
R. Kahlert, Supervisor, Hahnemann Hospital.....	37 21
S. McCann, General Nurse, Hahnemann Hospital.....	37 21
O. Palmer, General Nurse, Hahnemann Hospital.....	37 21
C. R. Petty, General Nurse, Hahnemann Hospital.....	37 21
F. N. Smith, General Nurse, Hahnemann Hospital.....	37 21
K. M. Snell, Supervisor, Hahnemann Hospital.....	37 21
M. Sanderson, Supervisor, Hahnemann Hospital.....	37 21
S. F. Schoupp, Supervisor, Hahnemann Hospital.....	37 21
M. Tuffin, Supervisor, Hahnemann Hospital.....	37 21
John Blai, Subsistence Cook, University Hospital.....	35 52
J. A. Wylley, Foreman, University Hospital.....	35 84
A. Johnson, Trayman, Hahnemann Hospital.....	30 52
Roman Carvajal, Window Washer, University Hospital.....	30 00
Fred C. Bode, Subsistence Dining Room, University Hospital.....	29 52
M. Flammong, Practical Nurse, Hahnemann Hospital.....	29 19
M. C. Murphy, Practical Nurse, Hahnemann Hospital.....	29 19
G. Orendain, Practical Nurse, Hahnemann Hospital.....	29 19
O. Olson, Night Cook, Hahnemann Hospital.....	28 52
George Boitano, Truck Driver, University Hospital.....	28 00
Frank Rockford, Wringer Laundry, University Hospital.....	27 25
Henry Shoemaker, Watchman, University Hospital.....	27 01
George Allen, Boiler Cleaner, University Hospital.....	26 52
G. Berg, Waiter, Hahnemann Hospital.....	26 52
Clarence Pierce, Subsistence Night Clerk, University Hospital.....	26 52
G. McLeod, Dietitian, Hahnemann Hospital.....	26 52
C. Crowell, Houseman, Hahnemann Hospital.....	25 52
Marin Crust, Subsistence, Walter, University Hospital.....	25 52
Emil Selegman, Subsistence Vegetableman, University Hospital.....	25 52
E. Wilmot, Painter, Hahnemann Hospital.....	25 17
Magno Valoria, Orderly, University Hospital.....	24 00
Frank Garman, Laundry Helper, University Hospital.....	24 00
Dominick Moran, Assistant Washer Laundry, University Hospital.....	23 52
M. Barrett, Dishwasher, Hahnemann Hospital.....	23 52
Herman Beyer, Subsistence Vegetableman, University Hospital.....	23 52
N. Brossner, Maid, Hahnemann Hospital.....	23 52
Geo. Collier, Subsistence Bus-boy, University Hospital.....	23 52
J. Deani, Trayman, Hahnemann Hospital.....	23 52
Bartolomeo De San Jose, Subsistence Trayman, University Hospital.....	23 52
W. S. Dugdale, Subsistence Reliefman, University Hospital.....	23 52
A. H. Durkman, Porter, Subsistence, University Hospital.....	23 52
Fred Fergg, Subsistence Porter, University Hospital.....	23 52
Geo. Fisk, Waiter, Hahnemann Hospital.....	23 52
J. Gamboa, Porter, Subsistence, University Hospital.....	23 52
C. V. Hansen, Trayman, Hahnemann Hospital.....	23 52
Bill Hess, Subsistence Porter, University Hospital.....	23 52
D. P. Huston, Trayman, Subsistence, University Hospital.....	23 52
Madamba Lucas, Subsistence Bus-boy, University Hospital.....	23 52
Vincent S. Mariano, Subsistence Trays, University Hospital.....	23 52
G. Miller, Porter, Hahnemann Hospital.....	23 52
C. L. Murio, Trayman, Hahnemann Hospital.....	23 52
Anselmo Musnei, Subsistence Trayman, University Hospital.....	23 52
Juan Musngi, Porter, Subsistence, University Hospital.....	23 52

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Weekly Salary
T. Nichols, Porter Hahnemann Hospital.....	23 52
L. Nitzki, Waiter Hahnemann Hospital.....	23 52
Henry Paris, Subsistence Bus-boy University Hospital.....	23 52
George Perez, Subsistence Bus-boy University Hospital.....	23 52
A. Raisin, Subsistence Pot Washer University Hospital.....	23 52
Gergeria Reyes, Subsistence Trayman University Hospital.....	23 52
Jess Smejkel, Subsistence Baker's Helper University Hospital.....	23 52
J. Stark, Pot Washer University Hospital.....	23 52
S. C. Suguitan, Trayman Subsistence University Hospital.....	23 52
Gregoria Suguitan, Bus-boy Subsistence University Hospital.....	23 52
W. Taylor, Reliefman Hahnemann Hospital.....	23 52
James Thompson, Subsistence Waiter University Hospital.....	23 52
E. Wagner, Dishwasher Hahnemann Hospital.....	23 52
J. M. Walsh, Subsistence Porter University Hospital.....	23 52
A. Wolgren, Trayman Hahnemann Hospital.....	23 52
Charles Hall, Porter University Hospital.....	23 52
E. Herstrom, Porter University Hospital.....	23 52
H. Metzger, Porter University Hospital.....	23 52
Steve O'Hagen, Porter University Hospital.....	23 52
Fred Sinding, Porter University Hospital.....	23 52
Frank Dolash, Porter University Hospital.....	23 52
Theo Kappel, Porter University Hospital.....	23 52
Maximo Ozuva, Porter University Hospital.....	23 52
Roman Ricardo, Porter University Hospital.....	23 52
Fred Van Dyke, Porter University Hospital.....	23 52
A. Winkleried, Porter University Hospital.....	23 52
Peter Woodwell, Porter University Hospital.....	23 52
Serafin Castillo, Porter University Hospital.....	23 52
Clarence Hanna, Orderly University Hospital.....	23 17
D. G. Harris, Porter University Hospital.....	23 17
James Hogan, Porter University Hospital.....	23 17
C. Panait, Porter University Hospital.....	23 17
Nils Paulson, Porter University Hospital.....	23 17
John McRae, Porter University Hospital.....	23 01
J. Bradley, Surgery Porter Hahnemann Hospital.....	22 52
E. Nobbe, Porter Hahnemann Hospital.....	22 18
A. Alvarado, Porter Hahnemann Hospital.....	22 02
A. Ballauff, Porter Hahnemann Hospital.....	22 02
W. Evans, Porter Hahnemann Hospital.....	22 02
H. Huyer, Porter Hahnemann Hospital.....	22 02
Victor Manuel, Orderly University Hospital.....	22 00
E. W. Murphy, Orderly Hahnemann Hospital.....	22 00
James Tillett, Orderly Hahnemann Hospital.....	22 00
Theo Casselman, Orderly University Hospital.....	21 84
Robert Fritsch, Orderly University Hospital.....	21 84
Harry Richman, Orderly University Hospital.....	21 84
W. R. Powis, Orderly University Hospital.....	21 68
W. O. Vinton, Porter Hahnemann Hospital.....	21 68
A. Wylie, Elevator Operator Hahnemann Hospital.....	21 00
Chas. Davis, Elevator Operator Hahnemann Hospital.....	20 84
F. Spiego, Reliefman Hahnemann Hospital.....	20 52
Dorothy Barker, Assistant Marker Laundry University Hospital.....	20 50
P. Butz, Maid Hahnemann Hospital.....	20 50
Josie Kindler, Press Hand Laundry University Hospital.....	20 50
Philomena Nieva, Pharmacy Helper University Hospital.....	20 50
Hattie Barlow, Folder Laundry University Hospital.....	19 50
M. Ratutanska, Ironer Laundry University Hospital.....	19 50
Olive Sykes, Ironer Laundry University Hospital.....	19 50
Kenneth Miller, Helper University Hospital.....	19 34
J. H. Dolan, Elevator Operator University Hospital.....	19 18
Celia Harper, Head Mangle Laundry University Hospital.....	19 00
Josephine Lambert, Assistant Pharmacist University Hospital.....	18 00
Ida Carvajal, Laundry Folder University Hospital.....	17 50
Miriam Paseco, Folder Laundry University Hospital.....	17 50
Mary Hodgkis, Mangle Laundry University Hospital.....	17 00
M. A. Hooke, Laundry Linen Room University Hospital.....	17 00
Lotta Morton, Mangle Laundry University Hospital.....	17 00
Carrie Nustat, Mangle Laundry University Hospital.....	17 00
Belle Sorel, Mangle Laundry University Hospital.....	17 00
May Sullivan, Mangle Laundry University Hospital.....	17 00
H. Gilmore, Elevator Operator University Hospital.....	16 35
M. Anderson, Telephone Operator Hahnemann Hospital.....	16 33
Amelia Ballard, Maid University Hospital.....	16 33
V. Beahn, Maid, University Hospital.....	16 33
Edith Berwin, Clerk, University Hospital.....	16 33
Emma Drain, Maid, University Hospital.....	16 33
G. Evans, Maid, University Hospital.....	16 33
Esther Ezzaoui, Telephone Operator, University Hospital.....	16 33
Helen Hogan, Maid, University Hospital.....	16 33

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Weekly Salary
Ada Holly, Maid, University Hospital.....	16 33
M. Hough, Maid, Hahnemann Hospital.....	16 33
May Iden, Maid, University Hospital.....	16 33
P. P. Light, Maid, University Hospital.....	16 33
Maxine Ludwig, Messenger, University Hospital.....	16 33
Sara Marshall, Maid, University Hospital.....	16 33
L. Marshall, Maid, University Hospital.....	16 33
C. Maynor, Maid, University Hospital.....	16 33
Mrs. M. Ozua, Maid, University Hospital.....	16 33
Ida Robbins, Maid, University Hospital.....	16 33
C. Russell, Maid, University Hospital.....	16 33
E. Seligmar, Maid, Hahnemann Hospital.....	16 33
Mrs. L. J. Stimson, Subsistence Maid, University Hospital.....	16 33
Alice Tobin, Maid, University Hospital.....	16 33
E. Tochet, Maid, University Hospital.....	16 33
Mrs. E. P. Tucker, Laboratory Maid, University Hospital.....	16 33
Carl Williams, Porter, University Hospital.....	16 33
Lauritz Jensen, Helper, University Hospital.....	16 30
M. Pledger, Maid, University Hospital.....	16 17
Ada Buckley, Clerk, University Hospital.....	16 00
Marie Bane, Maid, University Hospital.....	16 00
Julia Cederquest, Maid, University Hospital.....	16 00
Mrs. H. Crumpton, Maid, University Hospital.....	16 00
Alice Robinson, Messenger, University Hospital.....	16 00
Martha Werner, Pharmacy Helper, University Hospital.....	12 00
A. Van Os, Yardman, Hahnemann Hospital.....	6 00†

	Daily Wage
T. Schirrmacher, Keysmith, Repairs.....	\$12 00
F. M. Healy, Steam Foreman, Heat and Light.....	11 00
F. O. Lee, Electrician, Heat and Light.....	11 00
G. H. Blacker, Foreman Carpenter, Repairs.....	10 00
H. Chaloner, Plumber, Repairs.....	10 00
E. DeWar, Painter, Repairs.....	10 00
Frank Ervington, Steam Fitter, University Hospital.....	10 00
C. Jorgenson, Cement Worker, Site.....	10 00
W. D. Mason, Plumber, University Hospital.....	10 00
W. Sheperd, Electrician, Heat and Light.....	10 00
J. H. West, Steam Fitter, Heat and Light.....	10 00
A. H. White, Plumber, Repairs.....	10 00
G. W. Ahlvin, Carpenter, Repairs.....	9 00
M. James Peak, Pressman, Printing Office.....	9 00
H. Greene, Carpenter, Repairs.....	9 00
H. W. Krag, Carpenter, Repairs.....	9 00
K. C. Morrison, Carpenter, Repairs.....	9 00
P. Reichel, Carpenter, Repairs.....	9 00
H. Shepherd, Painter, Repairs.....	9 00
G. J. Steedman, Carpenter, Repairs.....	9 00
C. Steve, Carpenter, Repairs.....	9 00
F. Stokes, Carpenter, Repairs.....	9 00
W. N. Stromberg, Carpenter, Repairs.....	9 00
G. I. Brayton, Linotype Operator, Printing Office.....	8 50
W. Chambeiln, Linotype Operator, Printing Office.....	8 50
F. W. Crofoot, Compositor, Printing Office.....	8 50
Colln Haeger, Carpenter, University Hospital.....	8 50
Lawrence Haeger, Carpenter, University Hospital.....	8 50
G. Halling, Bookbinder, Printing Office.....	8 50
G. H. Minifie, Linotype Operator, Printing Office.....	8 50
James Bote, Painter, University Hospital.....	8 50
Cysbertus Twilt, Carpenter, University Hospital.....	8 00
J. T. Jack, Foreman, Site.....	7 75
V. Ariani, Bookbinder, Printing Office.....	7 66‡
E. Brundage, Bookbinder, Printing Office.....	7 66‡
R. Cushing, Compositor, Printing Office.....	7 66‡
F. Danish, Bookbinder, Printing Office.....	7 66‡
N. M. Duckworth, Compositor, Printing Office.....	7 66‡
F. A. Fielitz, Proofreader, Printing Office.....	7 66‡
W. L. Gordon, Compositor, Printing Office.....	7 66‡
Wm. Lang, Pressman, Printing Office.....	7 66‡
H. C. Mohr, Compositor, Printing Office.....	7 66‡
J. A. Rose, Bookbinder, Printing Office.....	7 66‡
J. Budd, Gardener, Site.....	7 00
G. McConnell, Laborer, Site.....	6 50
S. Kerr, Teamster, Site.....	6 50
J. Rodgers, Truck Driver, Site.....	6 50
J. Rosenberg, Laborer, Site.....	6 50
J. Shelby, Truck Driver, Site.....	6 50

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Daily Wage
J. M. Souza, Laborer, Site.....	6 50
E. M. Tidd, Laborer, Site.....	6 50
T. Quelling, Laborer, Site.....	6 50
G. Warren, Steam Filter Helper, Heat and Light.....	6 40
R. Ahern, Pressfeeder, Printing Office.....	6 00
T. Blitz, Gardener, Site.....	5 50
L. M. Cain, Gardener, Site.....	5 50
John Gomez, Gardener, University Hospital.....	5 50
N. M. Engle, Janitor and Helper, Printing Office.....	5 00
F. Fea, Gardener, Site.....	5 00
I. B. Frazier, Gardener, Site.....	5 00
E. Gertz, Painter, Hahnemann Hospital.....	5 00
P. Ghiarso, Gardener, Site.....	5 00
B. Pagnucci, Gardener, Site.....	5 00
J. Poggio, Gardener, Site.....	5 00
A. Van Hee, Gardener, Site.....	5 00
L. Varney, Gardener, Site.....	5 00
Nance Jory, Assistant in Bindery, Printing Office.....	4 34
Florence Bouve, Assistant in Bindery, Printing Office.....	3 50
Ada Grant, Assistant in Bindery, Printing Office.....	3 50
Florence Haefer, Assistant in Bindery, Printing Office.....	3 50
Margaretha Krieg, Assistant in Bindery, Printing Office.....	3 50
Nellie O'Connell, Assistant in Bindery, Printing Office.....	3 50
Anna Shea, Assistant in Bindery, Printing Office.....	3 50
Mildred Stephenson, Assistant in Bindery, Printing Office.....	3 50
Florence Rocha, Messenger, Printing Office.....	2 00
Charles Andrews, Instructor, University Farm.....	\$12 50
Robert Johnson, Instructor, University Farm.....	12 50
G. H. Cook, Inspector, Dairy Certification.....	10 00
F. Mendenhall, Teamster, Southern Branch.....	10 00
W. Smith, Carpenter, University Farm.....	7 00
I. Bowen, Draughtsman, Agriculture.....	6 00
Pat Brady, Carpenter, University Farm.....	6 00
Fred Gardner, Carpenter, University Farm.....	6 00
Schma Hertsgard, Special Nurse, Infirmary.....	6 00
R. C. Jaquith, Carpenter, University Farm.....	6 00
S. McBride, Carpenter, University Farm.....	6 00
T. Zumga, Horseshoer, University Farm.....	6 00
Lenna M. Abernathy, Instructor, Smith-Hughes.....	5 00
O. W. Aiken, Laborer, Lick Observatory.....	5 00
J. B. Balcomb, Instructor, Smith-Hughes.....	5 00
Clyde Blanchard, Job Analyses, Smith-Hughes.....	5 00
F. R. Cauch, Instructor, Smith-Hughes.....	5 00
H. T. Crocker, Field and Office Assistant, Agriculture.....	5 00
P. D. Croney, Instructor, Smith-Hughes.....	5 00
John S. Goldthwaite, Instructor, Smith-Hughes, Southern Branch.....	5 00
D. Hansen, Carpenter, University Farm.....	5 00
Julius A. Lorentzen, Official Advance Registry Test, University Farm.....	5 00
Geo. W. MacKenzie, Instructor, Smith-Hughes, Southern Branch.....	5 00
John G. Miller, Instructor, Smith-Hughes, Southern Branch.....	5 00
Lauriel Randall, Instructor, Smith-Hughes, Southern Branch.....	5 00
P. E. Rowell, Instructor, Smith-Hughes.....	5 00
May L. Sallander, Instructor, Smith-Hughes.....	5 00
Guy F. Street, Instructor, Smith-Hughes.....	5 00
Maud E. Wilson, Instructor, Smith-Hughes.....	5 00
F. Shimizu, Cleaner, Infirmary.....	4 34
Nance Jory, Assistant, Bindery Printing Office.....	4 25
H. O. Galloway, Laborer, Agriculture.....	4 00
W. H. Allison, Jr., Official Advance Registry Test, University Farm.....	4 00
R. H. Bishop, Official Advance Registry Test, University Farm.....	4 00
Henry Bivens, Official Advance Registry Test, University Farm.....	4 00
L. T. Brown, Official Advance Registry Test, University Farm.....	4 00
J. W. Dean, Official Advance Registry Test, University Farm.....	4 00
Daniel S. Flack, Official Advance Registry Test, University Farm.....	4 00
H. M. Foster, Official Advance Registry Test, University Farm.....	4 00
C. Freeman, Official Advance Registry Test, University Farm.....	4 00
L. W. Garretson, Official Advance Registry Test, University Farm.....	4 00
E. H. Gossling, Official Advance Registry Test, University Farm.....	4 00
C. D. Hutchinson, Official Advance Registry Test, University Farm.....	4 00
Nels B. Johansen, Official Advance Registry Test, University Farm.....	4 00
Albert Kelley, Official Advance Registry Test, University Farm.....	4 00
W. H. Kent, Official Advance Registry Test, University Farm.....	4 00
J. Russell Kerr, Official Advance Registry Test, University Farm.....	4 00
Ivan V. Knarr, Official Advance Registry Test, University Farm.....	4 00
W. H. Lawrence, Official Advance Registry Test, University Farm.....	4 00
Philip Livingston, Official Advance Registry Test, University Farm.....	4 00
J. A. Lorentzen, Official Advance Registry Test, University Farm.....	4 00
Herbert Louis, Official Advance Registry Test, University Farm.....	4 00
Vincent Magbetti, Official Advance Registry Test, University Farm.....	4 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Daily Wage
C. C. Norton, Official Advance Registry Test, University Farm.....	4 00
F. H. Patterson, Official Advance Registry Test, University Farm.....	4 00
E. K. Pitcher, Official Advance Registry Test, University Farm.....	4 00
John Ross, Official Advance Registry Test, University Farm.....	4 00
E. L. Stanley, Official Advance Registry Test, University Farm.....	4 00
J. A. Westfall, Official Advance Registry Test, University Farm.....	4 00
Maebelle J. Fisher, Assistant, Chemistry.....	4 00
E. M. Galloway, Laborer, Agriculture.....	3 50
G. M. Wallace, Laborer, Agriculture.....	3 50
Genevra M. Wearne, Assistant, Plant Physiology.....	3 00
Kenneth E. Lolmaugh, Helper, Dairy Sales.....	2 50
J. S. Rooney, Ticket Seller, Music and Drama.....	2 50
A. J. Sargenti, Laborer, University Farm.....	2 00
John Burns, Laborer, University Farm.....	1 50
Verna Dyer, Tray Setter, Infirmary.....	1 50
Alma Fendt, Usher, Music and Drama.....	1 00
Ralph Grant, Janitor, Infirmary.....	1 00
Stella Hupp, Usher, Music and Drama.....	1 00
Dorothy Luck, Usher, Music and Drama.....	1 00
Victor Lundy, Janitor, Infirmary.....	1 00
Vera Morse, Usher, Music and Drama.....	1 00
Vivian Osborn, Usher, Music and Drama.....	1 00
Jewell Perrin, Usher, Music and Drama.....	1 00

	Rate per Hour
Antonio Masfer, Instructor, Rehabilitation Southern Branch.....	83 00
Flora Hayes, Instructor, University Farm.....	1 75
J. Botenbrood, Sheet Metal Worker, Repairs.....	1 25
W. Goodfellow, Electrician, Heat and Light.....	1 25
Henry Williges, Teamster, Botany.....	1 25
W. Cody, Plumber, Southern Branch.....	1 12½
J. Monzo, Painter, Repairs.....	1 12½
W. St. John, Plumber, Southern Branch.....	1 12½
Frieda L. Abernathy, Artist, Paleontology.....	1 00
R. K. Bishop, Laborer, Walnut Research.....	1 00
H. Davis, Electrician, Southern Branch.....	1 00
J. Dunham, Carpenter, Southern Branch.....	1 00
Carl Epling, Artist, Botany Research.....	1 00
C. S. Frost, Electrician, University Farm.....	1 00
A. G. Goodrich, Reporter, President's Office.....	1 00
J. Harrington, Carpenter, Southern Branch.....	1 00
H. O. Jenkins, Instructor, University Farm.....	1 00
John L. Lynde, Map Drawing, University Farm.....	1 00
C. O. Dooley, Laborer, Southern Branch.....	87½
Kathleen Kennedy, Model, Arts, Southern Branch.....	83½
Wm. A. Parsons, Model, Arts, Southern Branch.....	83½
Helene Shepard, Model, Arts, Southern Branch.....	83½
Annie R. Smith, Model, Arts, Southern Branch.....	83½
W. F. Pemberton, Machinist, Mechanics.....	80
D. Holland, Police Officer.....	75
A. M. Kinne, Stenographer, Paleontology.....	75
E. S. Langford, Assistant, Citrus Experiment Station.....	75
Jennie Clauson, Graduate Assistant, Agricultural Laboratory.....	70
R. P. Crippen, Machinist, Mechanics.....	70
Raymond A. Hall, Machinist, Mechanics.....	70
G. J. Gatliff, Pruner, Citrus Experiment Station.....	61½
H. C. Bills, Machinist, Mechanics.....	65
K. H. Brookes, Machinist, Mechanics.....	65
A. L. Cowin, Machinist, Mechanics.....	65
I. W. Egge, Machinist, Mechanics.....	65
Lester Reukema, Machinist, Mechanics.....	65
M. A. Rotermund, Machinist, Mechanics.....	65
Orlof E. Rush, Machinist, Mechanics.....	65
L. W. Towner, Machinist, Mechanics.....	61
Frank Rose, Gardener, Agriculture.....	62½
W. A. Wiltberger, Police Officer.....	62½
Daphne H. Daus, Library Assistant, Library.....	60
A. W. Ellis, Lantern Operator, Drawing.....	60
C. Epling, Assistant, Chemical Laboratory.....	60
Gerda Frederiksen, Library Assistant, Library.....	60
I. M. Ingerson, Draftsman, Agriculture.....	60
H. P. Kyle, Draftsman, Agriculture.....	60
J. L. McCreery, Draftsman, Agriculture.....	60
E. G. Mowberg, Laboratory Assistant, Scripps Institute.....	60
L. M. Newlon, Assistant, Botany Research.....	61
W. A. Boggs, Laborer, Southern Branch.....	57
F. Holman, Laborer, Southern Branch.....	57
K. Scott, Laborer, Southern Branch.....	57
John Downey, Gardener, Agriculture.....	56½

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate per Hour Cents
A. Kruger, Gardener, Agriculture.....	56 1/2
C. R. Bearity, Helper, Mechanics.....	55
R. S. Childs, Helper, Mechanics.....	55
Austin Jones, Helper, Mechanics.....	55
Dorothy Kemper, Assistant, Paleontology.....	55
John A. Kerr, Helper, Mechanics.....	55
J. G. Landon, Helper, Mechanics.....	55
F. B. Owen, Helper, Mechanics.....	55
H. F. Bohnet, Assistant, Library.....	52
Loralle E. Abbott, Reader, English.....	50
D. L. Abercromble, Reader, Economics.....	50
Fred J. Adams, Reader and Assistant, Psychology.....	50
Helen Addicott, Assistant, Publications.....	50
W. E. Allen, Laboratory Assistant, Scripps Institute.....	50
Valerie Arnold, Reader, Philosophy.....	50
Francis Atkinson, Assistant, Scripps Institute.....	50
Helen Auberlin, Pianist, Physical Education, Women.....	50
M. H. Austin, Assistant Janitor, Southern Branch.....	50
Elizabeth Bailey, Stenographer, Botany.....	50
M. C. Baird, Reader, Economics.....	50
Elsie Baldwin, Cold Storage Assistant, Agriculture.....	50
Nadine M. Barbe, Reader, French.....	50
L. Barnard, Reader, Agriculture.....	50
R. W. Barr, Oiler, Mechanics.....	50
C. E. Baston, Reader, Mechanics.....	50
Elizabeth Beall, Clerical Assistant, Physical Education, Women.....	50
May M. Beekman, Reader, Mathematics, Southern Branch.....	50
M. Dorothy Beck, Reader, Hygiene.....	50
Laura Bethell, Reader, English.....	50
M. B. Beyer, Reader, Public Speaking.....	50
Reginald Biggs, Reader, English.....	50
S. A. Bjarnason, Laboratory Worker, Agriculture and Pomology.....	50
Wilda H. Black, Reader, English.....	50
A. C. Boettler, Reader, Philosophy.....	50
M. L. Bradford, Reader, English.....	50
C. J. Brenner, Preparator, Paleontology.....	50
L. L. Brown, Reader, Philosophy.....	50
W. W. Brown, Reader, Psychology.....	50
S. Burgess, Reader, English.....	50
E. E. Burrill, Reader, Economics.....	50
E. L. Buttner, Reader, Mechanics.....	50
P. Calori, Laborer, University Farm.....	50
A. F. Camp, Stenographer and Technical Assistant, Agriculture.....	50
E. M. Cantelow, Reader, Economics.....	50
I. A. Ceregihino, Reader, Jurisprudence.....	50
D. W. Chapman, Reader, Economics.....	50
A. A. Charlson, Reader, Mechanics.....	50
Traverse W. Clements, Reader, English.....	50
A. P. Coe, Reader, French.....	50
Blanche Coldren, Stenographer, Agriculture.....	50
J. Cottrell, Typist, Mechanics.....	50
A. E. Costanza, Reader, Economics.....	50
Eleanor Crofts, Reader, Philosophy.....	50
J. W. Coulter, Reader, Social Institutions.....	50
Franklin Cummings, Reader, English.....	50
Catherine Davis, Reader, English.....	50
Phosbe Davis, Reader, English.....	50
V. D. Davis, Assistant, Agriculture.....	50
Florence Denham, Typing, Smith Hughes.....	50
Katherine M. Denham, Reader, Public Speaking.....	50
Wesley H. DeSelle, Assistant, Library.....	50
Suzanne Donze, Reader, English and French.....	50
Hugh F. Dormody, Assistant, Recorder's Office.....	50
Dorothy G. Douglas, Reader, Psychology.....	50
R. Draeger, Assistant, Chemistry Laboratory.....	50
A. L. Eddy, Stock Room Assistant, Physical Education, Men.....	50
Clyde Edmundson, Stenographer, Irrigation.....	50
Agnes Edwards, Stenographer, Summer Session.....	50
Persis Edwards, Reader, Economics.....	50
A. W. Ellis, Lantern Operator, Site.....	50
K. L. Englebretson, Student Laborer, University Farm.....	50
M. A. Evans, Stenographer, Mechanics.....	50
R. M. Evans, Assistant, Basketball, Physical Education, Men.....	50
Leona Fasset, Reader, Philosophy.....	50
Henriette Fialon, Reader, French.....	50
W. S. Fortson, Reader, Economics.....	50
B. A. Freed, Reader, Mechanics.....	50
M. Galt, Reader, English.....	50
Alberta Galton, Reader, Philosophy.....	50
L. Geiermann, Assistant, Anatomy Research.....	50

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate per Hour Cents
Helen Gentry, Reader, English.....	50
Claire K. Gerbault, Reader, English.....	50
Joy Gerbault, Reader, English.....	50
William Garrett, Reader, English.....	50
Harold F. Glum, Helper, Zoology.....	50
C. N. Godshalk, Reader, Mathematics, Southern Branch.....	50
L. E. Gowen, Reader, Architecture.....	50
P. S. Grant, Reader, English.....	50
Arda Green, Reader, Philosophy.....	50
Virginia F. Green, Assistant, Recorder's Office.....	50
R. W. Griffin, Reader, Mechanics.....	50
K. M. Groesbeck, Reader, English.....	50
Hazel M. Haggerson, Reader, English.....	50
Marcus A. Hanner, Preparator, Paleontology.....	50
Ruth A. Hardy, Reader, English.....	50
Rose M. Harstein, Reader, French.....	50
Pearl Hays, Pianist, Physical Education, Women.....	50
H. H. Harris, Helper, Architecture.....	50
L. W. Henry, Reader, Paleontology.....	50
M. J. Heppner, Cold Storage Work, Agriculture.....	50
Mrs. Hernan, Reader, English.....	50
Muriel Hills, Reader, Psychology.....	50
G. C. Hockett, Preparator, Paleontology.....	50
G. C. Hockett, Preparer, Paleontology.....	50
J. B. Howell, Reader, English.....	50
Miss C. Hughes, Reader, English.....	50
Bernice Hutchison, Reader, Philosophy.....	50
Alice Irwin, Stenographer, Agriculture.....	50
Harry E. Jacob, Reader, Agriculture-Pomology.....	50
Karen Jacobsen, Reader, Psychology.....	50
Howard B. Kaster, Reader, Astronomy.....	50
Louis Kaye, Reader, English.....	50
L. Keissling, Assistant Janitor, Southern Branch.....	50
Dorothy D. Kemper, Reader, Paleontology.....	50
F. W. Ketjen, Reader, Philosophy.....	50
L. Kiesling, Reader, Mathematics, Southern Branch.....	50
G. C. Collins Lehman, Reader, English.....	50
Ardath Leonhart, Pianist, Physical Education, Women.....	50
Mary Levendusky, Assistant, Recorder's Office.....	50
Phillip Livingston, Laboratory Assistant, Agriculture.....	50
Lawrence C. Lockley, Reader, English.....	50
L. C. Lockley, Reader, English.....	50
H. R. Luck, Reader, English.....	50
Sarah Mabee, Stenographer, Smith-Hughes.....	50
Dorothy H. Maret, Stenographer, Citriculture and Pomology.....	50
W. C. Marsh, Reader, English.....	50
Irene May, Reader, English.....	50
Stella B. McCharles, Reader, Philosophy.....	50
Stanley McClintic, Reader, English.....	50
G. B. MacMahon, Stenographer, Political Science.....	50
D. McMillen, Assistant Janitor, Southern Branch.....	50
Walter S. Malloch, Reader, Agriculture.....	50
Ethel McMurchie, Reader, Economics.....	50
R. V. Miller, Reader, Mechanics.....	50
W. H. Miller, Reader, Economics.....	50
Florence Moses, Reader, Paleontology.....	50
Margery A. Mower, Reader, Psychology.....	50
Evelyn Murthin, Reader, English.....	50
J. A. Murdy, Student Laborer, University Farm.....	50
G. N. Nascha, Helper, Dept. Anatomy, University Hospital.....	50
Blanche Nelson, Reader, Psychology.....	50
Denise Neveu, Reader, French.....	50
C. D. Nielson, Reader, Jurisprudence.....	50
L. H. Nielson, Student Laborer, University Farm.....	50
P. A. O'Neil, Assistant, Basketball.....	50
G. W. Nigg, Reader, Mechanics.....	50
J. Nieucel, Reader, French.....	50
M. C. Paterson, Reader, English.....	50
Elizabeth Pennington, Typist, Library.....	50
Marion B. Phillips, Reader, English.....	50
P. Phillips, Janitor, Southern Branch.....	50
C. A. Pollard, Reader, Mechanics.....	50
E. G. Poole, Assistant, Library.....	50
R. R. Porter, Reader, Economics.....	50
Alice W. Porterfield, Assistant, Recorder's Office.....	50
Alice Potter, Assistant, Reader, Hygiene.....	50
Mabel E. Potts, Assistant, Library.....	50
Helen E. Provis, Typist, Zoology.....	50
T. E. Rawlins, Reader, Agriculture.....	50
H. W. Reed, Reader, Economics.....	50

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate Per Hour Cents
Russell Reukema, Wiper and Oiler, Mechanics.....	50
B. W. Reynolds, Tower Operator, Site.....	50
W. F. Rober, Reader, Economics.....	50
Carmel Riley, Assistant, Recorder's Office.....	50
Evelyn Robinson, Reader, Economics.....	50
Lilah Rumlcliffe, Reader, English.....	50
C. J. Ryan, Preparator, Paleontology.....	50
E. D. Schlaman, Preparator Project Outlines, Smith-Hughes Agriculture.....	50
Helen M. Seaman, Assistant, Recorder's Office.....	50
T. W. Sharp, Stenographer, Comptroller's Office.....	50
A. Shepart, Assistant Janitor, Southern Branch.....	50

(Part-time Employees)

George Shepphird, Reader, Mathematics, Southern Branch.....	50
Dorothy L. Smith, Reader, Mathematics, Southern Branch.....	50
E. Smith, Reader, Mechanics.....	50
Attala Solari, Reader, Psychology.....	50
E. P. Stridburg, Helper, Anatomy, University Hospital.....	50
H. J. Taylor, Helper, Agriculture.....	50
Harriet P. Thaler, Reader, English.....	50
A. B. Thomas, Stenographer, English.....	50
Louise H. Thompson, Stenographer, Philosophy.....	50
Jessie L. Thornton, Reader, Psychology.....	50
E. H. Trainer, Switchboard Operator, Southern Branch.....	50
Parker D. Trask, Reader, Paleontology.....	50
M. H. Trieb, Helper, Infirmary.....	50
Whitney Wells, Reader, English.....	50
M. H. Wells, Reader, English.....	50
Claude Wilcone, Reader, Mathematics, Southern Branch.....	50
F. Theresa Wildman, Reader, Economics.....	50
R. E. Wilson, Student Laborer, University Farm.....	50
R. M. Wise, Reader, Mechanics.....	50
Lawrence S. Wright, Assistant, Library.....	50
Mildred Wright, Reader, English.....	50
Horace L. Dormody, Assistant, Recorder's Office.....	47½
Peggy Ellis, Helper, Zoology.....	42
A. Adams, Assistant, Chemical Laboratory.....	45
H. Betts, Assistant, Chemistry.....	45
D. M. Bissel, Assistant, Chemistry Laboratory.....	45
G. Boies, Assistant, Chemistry.....	45
Ashley C. Browne, Assistant, Agriculture.....	45
Viva Bruce, Assistant, Chemistry.....	45
C. C. Buechel, Assistant, Chemistry.....	45
V. Cicchetini, Laborer, University Farm.....	50
Doris J. Crawford, Assistant, Bancroft Library.....	45
Robert P. Dart, Assistant, Recorder's Office.....	45
Charles de Sousa, Assistant, Chemical Laboratory.....	45
May Dornin, Assistant, Library.....	45
Marjorie Doyle, Assistant, Chemistry.....	45
Charles E. Finney, Assistant, Library.....	45
H. Glauque, Assistant, Chemistry.....	45
Margaret Graegen, Assistant, Chemistry.....	45
Josephine Halverson, Assistant, Library.....	45
Frances Hrubetz, Assistant, Chemistry.....	45
Fred C. Hutchinson, Assistant, Recorder's Office.....	45
Gladys Leavell, Assistant, Chemistry.....	45
B. H. MacLafferty, Assistant, Chemistry.....	45
J. Carl Madison, Assistant, Chemistry.....	45
Theodore Meyer, Assistant, Library.....	45
B. M. Miller, Clerk, Comptroller's Office.....	45
Anton Muribo, Laborer, University Farm.....	45
Earl C. Payne, Assistant, Chemistry.....	45
N. Loprest, Assistant, Library.....	45
Elizabeth Powell, Assistant, Chemistry.....	45
Alan Probert, Assistant, Chemistry.....	45
R. C. Ruthbone, Student Laborer, University Farm.....	45
Carl Rutz, Laborer, University Farm.....	45
A. Sandifer, Assistant, Chemistry.....	45
A. W. Sears, Assistant, Chemistry.....	45
Leonard G. Stevenson, Assistant, Chemistry.....	45
Raymond L. Suppes, Laboratory Assistant, Agriculture.....	45
Florence Swan, Assistant, Recorder's Office.....	45
H. P. Tockers, Assistant, Chemistry.....	45
Lillie Walker, Assistant, Chemistry.....	45
C. Waugh, Assistant, Chemistry.....	45
Marjorie West, Assistant, Chemistry.....	45
C. J. Whisman, Assistant, Chemistry.....	45

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate Per Hour Cents
Janet Willson, Assistant, Library.....	45
R. B. Wilson, Assistant, Library.....	45
Fern Wing, Assistant, Library.....	45
B. G. Wood, Assistant, Chemistry.....	45
Helen T. Alexander, Reader, Geography.....	40
Bertha Arfsworth, Clerical Assistant, Dean of Women.....	40
C. Austin, Student Laborer, University Farm.....	40
R. S. Bacon, Library Assistant, Agriculture.....	40
Vera Beach, Assistant Graduate Division.....	40
P. Becklund, Messenger, Music and Drama.....	40
E. Belk, Assistant, Chemistry.....	40
C. Berglund, Student Laborer, University Farm.....	40
R. J. Blatt, Laborer, Citrus Sales.....	40
Rachel I. Bretherton, Clerk, Graduate Division.....	40
C. E. Bush, Reader, Hygiene.....	40
D. W. Calfelt, Student Laborer, University Farm.....	40
Il. A. Cassidy, Student Laborer, University Farm.....	40
H. F. Clary, Stock Room Assistant, Physical Education, Men.....	30
L. A. Cleary, Reader Political Science.....	40
Adelaide J. Corbin, Laboratory Assistant, Agriculture.....	40
May S. Coreoran, Typist, Bancroft Library.....	40
M. P. Cowhig, Watchman, Wilmerding School.....	40
Ellis Crane, Student Laborer, University Farm.....	40
A. L. Davis, Inspector, Dairy Certification.....	40
I. E. Davis, Student Laborer, University Farm.....	40
Dorothy Deardorf, Reader, Slavic.....	50
F. de Villiers, Assistant Teaching, Agriculture.....	40
H. Dewar, Student Laborer, University Farm.....	40
L. Diether, Assistant, Chemistry.....	40
R. B. Dougherty, Student Laborer, University Farm.....	40
W. Doyl, Student Laborer, University Farm.....	40
J. L. Drees, Helper, Zoology.....	40
Ethel Edmonds, Typist, Bancroft Library.....	40
Eleanor J. Ellis, Clerical Assistant, Library.....	40
M. W. Farr, Student Laborer, University Farm.....	40
Neil Fifield, Student Laborer, University Farm.....	40
W. S. Fortson, Reader in Political Science.....	40
E. Fox, Student Laborer, University Farm.....	40
Elminda Garcia, Reader, Spanish.....	40
Clara Garfinkle, Stenographer, Vertebrate Zoology.....	40
C. O. Gerhardy, Nursery Work, Agriculture.....	40
I. Giauque, Assistant, Chemistry.....	40
W. H. Gibbs, Nursery Work, Agriculture.....	40
R. Ginsburg, Student Laborer, University Farm.....	40
Alice Greer, Typing Appointment Secretary.....	40
Annie Laurie Gregory, Assistant, Chemistry.....	40
M. A. Grizzle, Reader, Hygiene.....	40
Harriet H. Hackley, Assistant Recorder's Office.....	40
C. Hagan, Student Laborer, University Farm.....	40
W. P. Hall, Jr., Student Laborer, University Farm.....	40
Alice Hamilton, Laboratory Assistant, Household Science.....	40
S. P. Harrington, Laboratory Assistant, Agriculture.....	40
C. C. Harris, Laborer, Citrus Experiment.....	40
Marion Harris, Assistant, Agriculture.....	40
Ruth Hawood, Clerk, Smith Hughes, Part Time.....	40
Earle Hefner, Student Laborer, University Farm.....	40
R. Hendricks, Assistant, Chemistry.....	40
L. W. Heringer, Office Assistant, Physical Education, Men.....	40
F. Hester, Jr., Student Laborer, University Farm.....	40
Elsie Hill, Assistant, Laboratory, Agriculture.....	40
R. K. Hoyt, Clerk, College Letters and Science.....	40
Marguerite Howard, Clerk, Smith Hughes Part Time.....	40
I. K. Howeth, Kitchen Help, Infirmary.....	45
Howard Hunt, Helper, Zoology.....	40
Bernice Hutchison, Student Assistant, Household Art.....	40
C. H. Jackson, Student Laborer, University Farm.....	40
Allen W. Jacobs, Clerk Work, Agriculture.....	40
I. M. Johnston, Assistant, Herbarium Agriculture.....	40
D. A. Jones, Helper, Zoology.....	40
H. T. Keeler, Library Assistant.....	40
E. O. Kelsey, Helper, Zoology.....	40
Adele Kibre, Assistant, Graduate Division.....	40
W. Kiessig, Reader, Political Science.....	40
R. J. King, Student Laborer, University Farm.....	40
A. M. Larson, Student Laborer, University Farm.....	40
C. N. Larsen, Student Laborer, University Farm.....	40
Frances Leary, Library Assistant.....	40
Harvey W. Lee, Helper, Mining and Metallurgy.....	40

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate Per Hour Cents
W. A. Leonard, Student Laborer, University Farm.....	40
Hugh Logan, Laborer, University Farm.....	40
Adele Louderback, Seamstress, Infirmary.....	40
Georgia F. Lowry, Clerk, Education.....	40
Eleanor Lyons, Clerk, Infirmary.....	40
H. M. McDonald, Assistant in Track, Physical Education, Men.....	40
P. G. McElbany, Student Laborer, University Farm.....	40
John A. McKee, Assistant, Agriculture.....	40
Geo. Maher, Laboratory Helper, Botany.....	40
Anne Mallinson, Laboratory Assistant, Household Science.....	40
R. S. Marquess, Assistant, Soil Technology, Agriculture.....	40
Margaret Martin, Clerk, Education.....	40
A. B. Mason, Assistant, Recorder's Office.....	40
C. L. Metzker, Laborer, Citrus Experiment.....	40
V. R. Miller, Student Laborer, University Farm.....	40
D. E. Mogn, Reader, Geography.....	40
Arthur Mohr, Student Laborer, University Farm.....	40
Hugh L. Monahan, Library Assistant.....	40
W. E. Moores, Helper, Comptroller's Office.....	40
Clara Nickel, Mounter in Herbarium, Botany.....	40
J. S. Norton, Student Laborer, University Farm.....	40
B. K. Oliver, Laboratory Helper, Botany.....	40
Dorothy F. Osborn, Laboratory Assistant, Household Science.....	40
R. Douglas Patton, Assistant Recorder's Office.....	40
G. R. Paul, Student Laborer, University Farm.....	40
Lillian F. Peacock, Assistant, Hygiene.....	40
Doris Peoples, Assistant Recorder's Office.....	40
Ognaccio Perdoni, Student Laborer, University Farm.....	40
D. C. Perkins, Student Laborer, University Farm.....	40
Mary Perkins, Stenographer, Appointment Secretary.....	40
E. Jewell Perrin, Assistant, President's Office.....	40
Paul Pfeiffer, Library Assistant.....	40
J. A. Phillips, Student Laborer, University Farm.....	40
S. A. Pinkerton, Student Laborer, University Farm.....	40
Dorothea Prall, Reader, Slavic.....	40
Dorothy Puehler, Reader, Geography.....	40
C. G. Randall, Student Laborer, University Farm.....	40
Beth Rankin, Typist, Music and Drama.....	40
B. D. Rea, Laborer, Citrus Experiment.....	40
A. B. Reading, Jr., Assistant, Anthropology.....	40
W. Reynolds, Student Laborer, University Farm.....	40
Miss A. Robinson, Student Laborer, University Farm.....	40
M. Roel, Student Laborer, University Farm.....	40
Laura Rosel, Stenographer and Typist, Appointment Secretary.....	40
M. H. Ryer, Student Laborer, University Farm.....	40
Ernest Sagehorn, Assistant, Junior, Wilmerding School.....	40
J. G. Sanders, Clerk, President's Office.....	40
Edith Sanderson, Reader, Hygiene.....	40
J. Satterwhite, Jr., Assistant, Agriculture.....	40
J. G. Scofield, Student Laborer, University Farm.....	40
Vera R. Selmer, Stenographer, Vertebrate Zoology.....	40
S. P. Seton, Assistant, Chemistry Laboratory.....	40
A. J. Shields, Mailing Assistant, Agriculture.....	40
Earl Shriber, Soil Technology, Agriculture.....	40
F. J. Simons, Reader, Hygiene.....	40
Marion B. Smith, Reader, Anthropology.....	40
Herbert Spilman, Student Laborer, University Farm.....	40
C. M. Stay, Student Laborer, University Farm.....	40
P. V. Stay, Student Laborer, University Farm.....	40
Fannie Taggard, Assistant, Agriculture.....	40
Doris Taylor, General Office Work, Appointment Secretary.....	40
Glenn Thomas, Student Laborer, University Farm.....	40
M. Thornton, Typist, Bancroft Library.....	40
Eleanor Thrum, Reader, Geography.....	40
A. F. Tissot, Herbarium Assistant, Agriculture.....	40
Wm. Tussey, Student Laborer, University Farm.....	40
Ruth C. Van Vleet, Helper, Zoology.....	40
Leona Walker, Laboratory Assistant, Household Science.....	40
R. E. Warne, Laboratory Assistant, Agriculture.....	40
Margaret E. Watson, Clerk, Infirmary.....	40
Gertrude Weatherbee, Assistant, Agriculture.....	40
L. A. Webb, Laborer, University Farm.....	40
Geo. Weiser, Student Laborer, University Farm.....	40
L. Amy Wells, Laboratory Assistant, Infirmary.....	40
Clara J. Whisman, Assistant, Agriculture.....	40
A. G. Wightman, Student Laborer, University Farm.....	40
Irving Williams, Student Laborer, University Farm.....	40
Mary Wilson, Typing, Appointment Secretary.....	40
L. Wulf, Assistant, Chemistry Laboratory.....	40

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate Per Hour Cents
Alma Young, Typist, Agriculture.....	40
Francis G. Everett, Assistant, Recorder's Office.....	37½
W. H. James, Assistant, Recorder's Office.....	37½
T. W. Ralston, Assistant, Recorder's Office.....	37½
Carol Seabury, Assistant, Recorder's Office.....	37½
Russell R. Yates, Assistant, Recorder's Office.....	37½
O. Ahnstadt, Assistant, Mailing Room.....	35
Edith Akerly, Assistant Recorder's Office.....	35
L. P. Anderson, Telephone Operator, Comptroller's Office.....	35
Melvin L. Anderson, Assistant Recorder's Office.....	35
Olga Ardell, Assistant Osteology, Dentistry.....	53
Marjorie J. Armour, Helper, Physical Education, Women.....	35
Eleanor Ashby, Assistant Bancroft Library.....	35
Ewing B. Avery, Library Assistant.....	35
Charles F. Batchelder, Library Assistant.....	35
L. D. Bernard, Laboratory Assistant, Agriculture.....	35
R. E. Berry, Assistant Recorder's Office.....	35
J. Blaney, Assistant, Chemistry.....	35
Katherine Boardman, Clerk, Agriculture.....	35
Margaret Bravinder, Assistant Recorder's Office.....	35
L. A. Brown, Clerical Assistant, Physical Education, Men.....	35
Paul Burrill, Library Assistant.....	35
Helen Campbell, Library Assistant.....	35
W. G. Carr, Library Student Help, Southern Branch.....	35
D. C. Caudron, Chemist's Assistant, Agriculture.....	35
Lois Chilcote, Assistant, Osteology, Dentistry.....	35
M. H. Chong, Laboratory Helper, Agriculture.....	35
Baxter J. Christenson, Library Assistant.....	35
Anita Compton, Assistant Recorder's Office.....	35
S. M. Conner, Clerical Assistant, Physical Education, Men.....	35
Florence Conner, Clerk, Business Office, Southern Branch.....	35
G. Connitt, Assistant, Chemistry.....	35
Edna Cooper, Helper, Physical Education, Women.....	35
John Craig, Library Assistant.....	35
H. W. Crockett, Messenger, President's Office.....	35
R. M. Cutshall, Helper, Gymnasium, Southern Branch.....	35
Lucille Czarowski, Helper, Physical Education, Women.....	35
A. J. Daneri, Assistant Biology, Dentistry.....	35
Catherine Davis, Helper, Physical Education, Women.....	35
A. E. Dewey, Laboratory Assistant, Agriculture.....	35
Pauline Elder, Library Assistant.....	35
A. R. Elftman, Library Assistant.....	35
H. O. Elftman, Library Assistant.....	35
A. W. Ellis, Assistant, Mailing Room.....	35
Sara Ellisberg, Library Assistant.....	35
Lella Ewert, Helper, Physical Education, Women.....	35
J. E. Fairfield, Assistant, Mailing Room.....	35
J. L. Fealy, Library Assistant.....	35
Anna Fisher, Assistant, Chemistry.....	35
W. F. Fleming, Assistant, Osteology, Dentistry.....	35
J. O. Furby, Library Assistant.....	35
Ellen Gall, Helper, Physical Education, Women.....	35
Anna Gayton, Helper, Physical Education, Women.....	35
Raynor Geisendorfer, Assistant Recorder's Office.....	35
D. Geraldine, Assistant, Chemistry.....	35
R. V. Gogate, Library Assistant.....	35
Rexford Lewis Gordon, Library Assistant.....	35
Hilda M. Gray, Typist, Library.....	35
Laura Halverson, Library Assistant.....	35
Gladys Hamilton, Helper, Physical Education, Women.....	35
Irene Harris, Library Assistant.....	35
R. V. Harris, Assistant Recorder's Office.....	35
Trafford Hill, Copyist, Architecture.....	35
Hilda M. Holmes, Assistant Recorder's Office.....	35
Hazel Huber, Office Assistant, Agriculture.....	35
Anna Hughes, Student Help, Library, Southern Branch.....	35
Geo. H. Hughes, Assistant Osteology, Dentistry.....	35
Vera Hughes, Library Assistant, Southern Branch.....	35
Stella Gertrude Hupp, Library Assistant.....	35
Albert T. Huxley, Library Assistant.....	35
W. Jessup, Assistant, Chemistry.....	35
H. R. Johnson, Operative Dentistry.....	35
Muriel Johnson, Telephone Operator.....	35
Arthur M. Junck, Assistant, Biology Dentistry.....	35
G. L. Keith, Assistant Recorder's Office.....	35
Louise Kerr, Library Assistant.....	35
Julia Kethen, Helper, Physical Education, Women.....	35
Tilton Kelburn, Library Assistant.....	35
Robert E. King, Assistant Recorder's Office.....	35

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate Per Hour Cents
Marjorie Lange, Assistant Recorder's Office.....	35
Clara Long, Library Assistant.....	35
Ragle W. Lynn, Library Assistant.....	35
W. O. McKay, Assistant, Bancroft Library.....	35
Gordon McKenzie, Library Assistant.....	35
Roe M. McLaughlin, Library Assistant.....	35
Lillian Mallory, Helper, Physical Education, Women.....	35
E. F. Marquardson, Clerical Assistant, Physical Education, Men.....	35
Charlotte Martin, Library Assistant.....	35
Carrie Mather, Library Assistant.....	35
Margery Meedham, Assistant Secretary, Southern Branch.....	35
Anna Merlin, Library Assistant.....	35
Mary E. Mickel, Library Assistant.....	35
A. R. Monroe, Library Assistant.....	35
Gladys E. Moosekian, Helper, Business Office, Southern Branch.....	35
Marc T. Morrissey, Assistant Recorder's Office.....	35
Eva Neal, Helper, Physical Education, Women.....	35
Mildred L. Nichols, Assistant Biology, Dentistry.....	35
Charles M. Nichols, Library Assistant.....	35
L. E. Noe, Assistant, Dentistry.....	35
Violet Osborne, Student Assistant, Household Arts.....	35
Velma Perow, Assistant, Chemistry Laboratory.....	35
R. Pool, Assistant, Chemistry.....	35
A. D. Powers, Jr., Clerical Assistant, Physical Education, Men.....	35
Ethel Quick, Library Assistant.....	35
Leslie Quick, Library Assistant.....	35
T. W. Ralston, Assistant, Recorder's Office.....	35
S. H. Rathbun, Assistant Prosthetic Dentistry.....	35
Elizabeth Roberts, Library Assistant.....	35
Laura Rosel, Helper, Physical Education, Women.....	35
Mattie E. Rowley, Helper, Business Office, Southern Branch.....	35
Elizabeth Vaughn, Library Assistant, Southern Branch.....	35
A. Rudawsky, Assistant, Chemistry.....	35
Edith Sanderson, Helper, Physical Education, Women.....	35
Dayton I. Scott, Library Assistant.....	35
Philip Small, Library Assistant.....	35
H. Smith, Assistant, Chemistry.....	35
L. Soohoo, Assistant Chemistry.....	35
Esther Soule, Assistant Recorder's Office.....	35
G. Stark, Assistant, Chemistry.....	35
Bernice Stephens, Assistant Recorder's Office.....	35
H. E. Stephens, Assistant, Mailing Room.....	35
Correlle B. Stone, Library Assistant.....	35
K. E. Stringer, Assistant, Mailing Room.....	35
Frances G. Stuart, Clerk, Agriculture.....	35
Marion Sutton, Library Assistant.....	35
F. E. Taylor, Assistant, Mailing Room.....	35
J. A. Thateber, Assistant, Research Department, Dentistry.....	35
A. P. Tiehenor, Assistant Biology, Dentistry.....	35
M. Tower, Assistant, Chemistry.....	35
C. E. Turner, Assistant, Mailing Room.....	35
A. J. Vance, Assistant Metallurgy, Dentistry.....	35
Eliz. Vaughn, Student Help, Library Southern Branch.....	35
Helen Wallace, Clerk, Business Office, Southern Branch.....	35
Florence Wayne, Student Assistant, Household Art.....	35
Geo. Weiman, Assistant Biology, Dentistry.....	35
N. C. Wells, Assistant Chemistry.....	35
Ralph A. Wentz, Library Assistant.....	35
C. Withers, Assistant, Chemistry.....	35
J. L. Wood, Janitor, Rubidoux Laboratory.....	35
Maude Wood, Assistant, Chemistry.....	35
N. R. Woodard, Helper, Gymnasium, Southern Branch.....	35
A. D. Woods, Assistant, Chemistry.....	35
H. E. Wright, Assistant, Mailing Room.....	35
Viv. R. Young, Student Assistant, Household Art.....	35
Livingston Jenks, Reader, Philosophy.....	33½
Miss Elsa Barth, Helper, Philosophy.....	33½
J. G. Hatfield, Assistant Recorder's Office.....	32½
Olin M. Holmes, Assistant Recorder's Office.....	32½
Ruth E. Jenkins, Assistant Recorder's Office.....	30
Lynn M. Barrett, Library Assistant.....	30
Ida Beckwith, Assistant Recorder's Office.....	30
Cyril F. Belliss, Library Assistant.....	30
Harry Benten, Music and Drama, Errand Boy.....	30
A. E. Bevier, Library Assistant.....	30
P. A. Brunk, Assistant Recorder's Office.....	30
Guy C. Calden, Assistant Recorder's Office.....	30
Catharine Clark, Library Assistant.....	30
C. M. Curley, Assistant Recorder's Office.....	30

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate Per Hour Cents
J. C. Dunbar, Assistant Recorder's Office.....	30
Alice-Marie Engebretsen, Library Assistant.....	30
J. P. Falconer, Assistant Recorder's Office.....	30
J. R. Gibbons, Library Assistant.....	30
Rolph Edward Grant, Library Assistant.....	30
H. W. Holmer, Library Assistant.....	30
Gaylord J. Jones, Library Assistant.....	30
Deborah King, Library Assistant.....	30
May Belle Long, Library Assistant.....	30
Marie R. McDonald, Assistant Recorder's Office.....	30
Robina C. Mackinnon, Library Assistant.....	30
Anna Meakin, Assistant Recorder's Office.....	30
Andrew M. Moore, Assistant Recorder's Office.....	30
Marguerite Nunan, Library Assistant.....	30
Paul O'Neil, Assistant Recorder's Office.....	30
John W. Otterson, Assistant Recorder's Office.....	30
A. Carl Rowe, Assistant Recorder's Office.....	30
Hugh E. Schilling, Assistant Recorder's Office.....	30
Madeline Scott, Library Assistant.....	30
L. G. Stevenson, Laboratory Assistant, Agriculture.....	30
Mrs. Addie Swapp, Library Assistant.....	30
L. Thompson, Assistant, Chemistry.....	30
Dorothy Van Wagenen, Assistant Recorder's Office.....	30
Evelyn H. Woodward, Assistant Recorder's Office.....	30
B. Adams, Assistant, Chemistry.....	25
Francis Smyth, Helper, Research, Medicine, Library, University Hospital.....	25
I. M. Ingerson, Assistant, Military Science and Tactics.....	25
F. L. Landon, Assistant, Military Science and Tactics.....	25
G. B. Legge, Assistant, Military Science and Tactics.....	25
Ruth M. McGinry, Assistant, Bancroft Library.....	25
R. K. Paine, Assistant, Military Science and Tactics.....	25
K. Priestley, Laboratory Assistant, Agriculture.....	25
A. H. Traum, Helper, Laboratory, Agriculture.....	25
H. H. Wellander, Assistant, Military Science and Tactics.....	25

MISCELLANEOUS.

Dorothy H. Bruce, Reader, English.....	25c book
Selena Pope Ingram, Reader, English.....	10c book
W. A. Brewer, Jr., Editor University Calendar.....	\$2.50 issue
Catherine Davis, Reader, English.....	25c paper
Mrs. M. V. Sanchez, Translator of Spanish, Bancroft Library.....	\$2.25 per thousand words
R. Curtis, Carpenter, University Farm.....	\$3.00 per thousand shingles
M. E. Welsh, Carpenter, University Farm.....	\$3.00 per thousand shingles
C. F. Spencer, Collector University and Hahnemann Hospitals.....	25 per cent of collections

(Special Part-Time Employment of Teachers, Lecturers, Readers, etc., by the University Extension Division.)

NOTE—Those marked "U" employed in other departments of the University.

Name and Title	Rate	Amount received for month of December
Robert G. Aitken, Lecturer.....	\$26.63 per Lecture.....	U \$21 63
Sigmund Beel, Musician.....	\$1.60 per Lesson.....	25 66
Clyde Blanchard, Instructor.....	\$10.00 per Hour.....	45 00
T. F. Blanchard, Lecturer.....	\$26.00 per Lecture.....	25 00
Mrs. M. E. Blanchard, Instructor, Music.....	80 per cent of Fees to \$150.00.....	16 80
Anthony F. Blanks, Lecturer.....	\$25.00 per Lecture.....	75 00
J. V. Breitwieser, Lecturer.....	\$20.00 per Lecture.....	U 40 00
R. J. Brower, Reader.....	\$20.00 per Month.....	U 20 00
Edith L. Brown, Instructor.....	80 per cent of Fees to \$150.00.....	21 60
Warner Brown, Lecturer.....	\$22.00 per Lecture.....	U 22 00
Mrs. Dorothy H. Bruce, Reader, English.....	25 cents per Paper.....	50 50
Mrs. Dorothy H. Bruce, Editorial Work.....	1 Course at \$20.00.....	20 00
Mrs. Dorothy H. Bruce, Editorial Work.....	1 Course at \$2.00.....	2 00
Harold L. Bruce, Lecturer, Fresno Clinical Group.....	\$20.00 per Lecture.....	U 20 00
Harold L. Bruce, Instructor, Menlo Park.....	\$22.00 per Trip.....	U 63 00
H. C. Bryant, Instructor.....	$\frac{2}{3}$ of Fees to \$150 and Special Class at \$10 per Lecture.....	49 20
Raymond L. Buell, Lecturer.....	\$20.00 per Lecture.....	20 00
E. F. Burrill, Reader, Economics.....	25 cents per Paper.....	7 25
M. V. Campbell, Instructor, Blue Print Reading.....	$\frac{2}{3}$ of Fees to \$150.00.....	17 07
Miss N. L. Campbell, Instructor.....	$\frac{2}{3}$ of Fees to \$150.00 per Course.....	144 00
Wm. W. Carruth, Instructor, Music.....	80 per cent of Fees to \$150.00.....	24 00
Robert G. Cleland, Lecturer.....	\$25.00 per Lecture.....	25 00
Roy Cowles, Instructor, Electricity.....	$\frac{2}{3}$ of Fees to \$150.00.....	81 68

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate	Amount received for month of December
Ira B. Cross, Instructor.....	1 Course \$5.00 per Hour and 1 Course \$10.00 per Hour.....	U 69 00
B. C. Crum, Reader, English.....	15 cents per Paper; 25 cents per Paper and Clerical Work 50 cents per Hour.....	37 70
Edgar Dawson, Lecturer.....	\$35.00 per Lecture.....	35 00
M. M. Dobrzensky, Instructor.....	2 Courses, $\frac{1}{2}$ of Fees to \$150.00; 1 Course at \$5.00 per Hour; 1 Course at \$10.00 per Hour.....	U 77 08
E. G. Dunn, Janitor Service.....	\$1.00 per Week.....	4 00
Cecil Edgar, Part-time Clerk.....	50 cents per Hour.....	50
Alan E. Edson, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00.....	30 00
Silas Evans, Lecturer.....	\$25.00 per Lecture.....	25 00
Felix Flugel, Instructor.....	2 Courses at \$5.00 per Hour; 1 Course at \$10.00 per Hour.....	U 50 00
Thomas F. Freeman, Instructor, Music.....	80 per cent of Fees to \$150.00.....	8 00
Thomas F. Freeman, Rental of Studio.....	\$10.00 per Month.....	20 00
L. S. Gerlough, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00.....	9 33
Virginia Graham, Instructor, Music.....	80 per cent of Fees to \$150.00.....	U 108 00
Florence Guppy, Reader, Music.....	25 cents per Paper.....	7 50
Sigra E. Hagelthorn, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00.....	48 00
E. E. Hall, Preparation of Courses.....	\$10.00 per Assignment.....	U 300 00
George M. Harrington, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00.....	5 50
Rosel Hill, Pianist.....	\$10.00 per Concert.....	10 00
A. L. Jordan, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00.....	81 60
A. S. Kaun, Lecturer.....	\$20.00 per Lecture.....	U 20 00
John F. Kessel, Reader, Biology.....	25 cents per Paper.....	3 75
Russell Kidder, Part-time Clerk.....	50 cents per Hour.....	50
E. A. Kincaid, Reader, Economics.....	25 cents per Paper.....	U 32 50
E. A. Kincaid, Instructor, Economics.....	$\frac{1}{2}$ of Fees to \$150.00.....	U 19 50
Judson Krueger, Instructor, Elementary Accounting.....	\$12.00 per Meeting.....	120 00
Chas. H. Kruger, Reader, Mathematics.....	25 cents per Paper.....	2 00
Yoshi Kuno, Instructor.....	All Fees to \$0.00.....	U 16 20
M. Henry Langrad, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00 per Course.....	180 00
F. T. Lucas, Instructor, Technical.....	25 per cent of Fees to \$112.50 per Course.....	150 00
Ivander MacIver, Reader, History.....	25 cents per Paper.....	U 3 50
O. E. Mack, Reader, Economics.....	25 cents per Paper.....	U 3 56
Marie H. Macquarrie, Musician.....	\$20.00 per Concert.....	20 00
Paul Marhenke, Reader, Philosophy.....	25 cents per Paper.....	6 00
U. J. Marra, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00 per Course.....	U 152 00
Bernice McCabe, Reader, Economics.....	25 cents per Paper.....	25 75
R. G. McCulloch, Reader, Economics.....	25 cents per Paper.....	24 75
Alice Merrill, Reader, French.....	25 cents per Paper.....	19 50
A. L. Merrill, Instructor, Auto Shop.....	40 per cent of Fees to \$180.00.....	35 60
Emma T. Mills, Reader, Home Economics.....	25 cents per Paper.....	3 50
Ralph Minor, Preparing Courses.....	\$10.00 per Assignment.....	U 10 00
Ralph Minor, Preparation of Laboratory Equipment.....	\$100.00 for Entire Preparation.....	U 50 00
Mrs. R. A. Monroe, Reader, Mathematics.....	25 cents per Paper.....	5 00
Agnes Pay Morgan, Reader, Home Economics.....	25 cents per Paper.....	U 4 00
Mrs. Alice Muma, Musician.....	\$15.00 per Concert.....	15 00
Sylvain Noack, Musician.....	\$20.00 per Concert.....	20 00
R. A. Nyman, Reader, Education.....	25 cents per Paper.....	1 25
Olga Orth, Musician.....	\$7.50 per Concert.....	7 50
Tony Ottoboni, Janitor Service.....	\$10.00 per Month.....	10 00
H. E. Owen, Instructor.....	80 per cent of Fees or \$1.00 per Lesson.....	15 00
Mary T. Paine, Reader, Mathematics.....	25 cents per Paper.....	U 67 75
W. H. Paine, Reader, Mathematics.....	25 cents per Paper.....	3 75
Clara Pasvolksky, Musician.....	\$75.00 per Concert.....	75 00
Paul Perigord, Lecturer.....	\$25.00 per Lecture.....	150 00
V. H. Polistata, Instructor, English.....	$\frac{1}{2}$ of Fees to \$150.00.....	60 80
Mabel E. Potts, Clerk.....	45 cents per Hour.....	45 84
A. L. Price, Reader, Journalism.....	25 cents per Paper.....	11 50
T. S. Romero, Instructor.....	$\frac{1}{2}$ of Fees.....	249 20
T. S. Romero, Reader, Spanish.....	25 cents per Paper.....	40 00
Carl G. A. Rosen, Instructor.....	$\frac{1}{2}$ of Fees to \$150.00.....	20 00
Albert E. Rosenthal, Musician.....	\$20.00 per Concert.....	20 00
Albert E. Rosenthal, Musician.....	\$2.40 per Lesson.....	2 40
Gustavus Schneider, Reader, Education.....	25 cents per Paper.....	U 4 37
Axel Simonsen, Musician.....	1 Concert at \$20 and 1 Concert at \$30.....	50 00
Miss L. J. Simpson, Reader, English.....	25 cents per Paper.....	25 50
F. J. Smiley, Lecturer.....	\$7.50 per Hour.....	63 40
Mrs. L. P. Sooy, Instructor.....	63 per cent of fees to \$150 per Course.....	140 53
C. C. Stachling, Instructor.....	$\frac{1}{2}$ of Fees to \$300.00 and 1 Course at \$10.00 per Hour.....	U 145 00

UNIVERSITY OF CALIFORNIA—Continued.

Name and Title	Rate	Amount received for month of December
B. F. Stelter, Instructor.....	66 per cent of Fees to \$150 per Course.....	U 468 00
H. J. Stonier, Instructor.....	3 of Fees to \$150.00.....	17 60
Ralph B. Weaver, Instructor, Technical.....	3 of Fees to \$150.00.....	25 92
Geo. M. Stratton, Lecturer.....	\$40.00 per Lecture.....	U 40 00
Aram Torossian, Instructor, Elements of Architecture.....	3 of Fees to \$150 00.....	1 34
Earnest A. Trabert, Reader, Technical.....	25 cents per Paper.....	54 00
Walker L. Trammell, Instructor.....	\$25.00 per Lecture and \$12.50 per Extra Lesson.....	232 50
E. H. Tucker, Instructor, Economics.....	\$10.00 per Hour.....	30 00
Zelia Vaissade, Instructor, Music.....	80 per cent of Fees to \$150.00.....	19 20
J. J. Van Nostrand, Preparation of History Courses.....	2 Courses at \$35.00 and 1 Course at \$30.50.....	U 131 50
M. Van Waters, Instructor.....	3 of Fees to \$150.00.....	28 80
D. E. Watkins, Instructor.....	3 Courses at \$5.00 per Hour; 2 Courses 3 of Fees to \$150.00.....	U 137 00
Julian Waybur, Instructor, Music.....	\$3.20 per Lesson.....	U 16 00
Arthur Weiss, Musician.....	80 per cent of Fees to \$150.00.....	8 00
Benjamin Ide Wheeler, Lecturer at Scotia and Arcata.....	\$50.00 per Lecture.....	105 00
R. F. Whitehurst, Instructor.....	3 of Fees to \$150.00.....	40 00
Maud Whitlock, Reader, Home Economics.....	25 cents per Paper.....	3 62
R. E. Wiatt, Instructor.....	3 of Fees to \$150.00.....	73 83
Frayne Williams, Lecturer.....	\$40.00 per Lecture.....	46 00
M. J. Williamson, Reader, Drawing.....	25 cents per Paper.....	U 2 75
Cedric Wright, Instructor.....	\$2.40 per Lesson.....	9 60

VETERANS' HOME OF CALIFORNIA.

Veterans' Home, California, February 11, 1921.

Report to State Civil Service Commission in accordance with joint resolution of the State Legislature passed January 14, 1921, Veterans' Home of California.

Name of Officer or Employee and Title	Monthly Salary
N. M. Holderman, Colonel-Commandant.....	\$394 00
J. N. Blood, Major-Chief Surgeon.....	270 50
E. C. Borman, Captain, Chief Engineer.....	215 50
D. F. Callinan, Captain, Assistant Surgeon.....	220 50
C. de Colmesnil, Secretary-Treasurer.....	220 50
F. P. Bliss, Captain, Quartermaster-Commissary.....	197 00
S. M. Montgomery, Captain, Adjutant.....	160 25
L. Ponsetto, Chef, Main Kitchen.....	175 00
L. McCray, Foreman, Farm.....	155 00
W. J. Watson, First Cook, Hospital.....	155 00
A. A. Kuhn, Fireman.....	130 00
R. F. Matthews, Fireman.....	130 00
J. Van de Leur, Fireman.....	130 00
J. H. Russell, Plumber's Helper.....	130 00
E. Burke, Surgical Nurse.....	130 00
R. Merrill, Assistant Cook, Main Kitchen.....	130 00
E. Hurliman, Assistant Secretary-Treasurer.....	135 00
E. Jelde, Bookkeeper.....	135 00
M. Mitchell, Druggist.....	135 00
N. D. Alexander, Surgical Attendant and Undertaker.....	145 00
C. C. Camp, Tinsmith.....	145 00
H. C. Dado, Assistant Engineer.....	145 00
W. Tonascia, Plumber.....	145 00
H. M. Montgomery, Head Nurse.....	105 00
J. Davis, First Attendant.....	105 00
A. Kemp, First Attendant.....	105 00
T. A. Wurm, Band Leader.....	105 00
W. S. Saylor, Caretaker, Hog Ranch.....	110 00
J. Massoni, Truck Driver.....	110 00
E. Judd, Relief Nurse.....	110 00
N. Kistler, Nurse.....	110 00
B. Garrison, Night Attendant.....	110 00
F. Fitzgibbons, Night Attendant.....	110 00
L. Baird, Second Cook.....	110 00
E. Lincoln, Stenographer.....	110 00
M. A. Steere, Stenographer.....	110 00

VETERANS' HOME OF CALIFORNIA—Continued.

Name of Officer or Employee and Title	Monthly Salary
R. W. Chord, Bus Driver.....	110 00
J. W. Halter, Florist.....	115 00
J. W. McDonald, Blacksmith.....	115 00
C. Dettling, Chief Baker.....	120 00
M. Moran, Nurse.....	120 00
F. Clark, Foreman, Chicken Ranch.....	120 00
D. Ferrissey, Butcher.....	120 00
E. G. Giles, Foreman, Laundry.....	125 00
H. Ralston, Night Supervisor.....	125 00
C. L. Doyon, Dairyman.....	125 00
G. De Benedetti, Head Gardener.....	125 00
C. Johnson, Assistant Band Leader.....	80 00
E. P. Cook, Seamstress.....	80 00
T. Galvin, Second Cook, Hospital.....	80 00
E. L. Fihner, Hospital Adjutant.....	90 00
M. M. Reagan, Housekeeper.....	85 00
A. Keyser, First Attendant.....	85 00
J. Koon, Head Waitress.....	85 00
S. Murbach, Head Waitress.....	85 00
G. G. Austin, Chief Clerk, Quartermaster Department.....	90 00
L. R. Greene, First Attendant.....	90 00
G. Doyle, Teamster.....	95 00
R. Stinebaugh, Laborer.....	95 00
F. Rosel, Laundress and Tailor.....	95 00
M. Garrison, First Attendant.....	100 00
J. R. Judd, First Attendant.....	100 00
L. Schroeder, First Attendant.....	100 00
P. Fihner, First Attendant.....	100 00
F. Dettling, Second Baker.....	100 00
E. R. Younger, Helper and Watchman.....	55 00
E. Williams, First Attendant.....	55 00
J. Doyle, Teamster.....	60 00
F. Ashenfelder, Laborer.....	60 00
J. Stewart, Ref'g Engineer.....	60 00
J. Tague, Laborer.....	60 00
J. F. Gallagher, Laborer.....	60 00
G. Bailey, Laborer.....	60 00
G. Bungard, Laborer.....	60 00
J. C. Whalen, Laborer.....	60 00
J. Green, Laborer.....	60 00
J. Toole, Laborer.....	60 00
N. Reagen, Laborer.....	60 00
L. Gruner, Laborer.....	60 00
J. Scheiffey, Laborer.....	60 00
A. Noble, Laborer.....	60 00
W. Chalker, Laborer.....	60 00
J. Q. Cowen, Foreman Painter.....	60 00
W. Johnstone, Foreman Carpenter.....	60 00
J. W. Beck, Sergeant Major.....	60 00
F. Mooney, Gravedigger.....	60 00
T. L. Crawford, Gravedigger.....	60 00
H. Westcott, Hospital Carpenter.....	60 00
A. C. Gill, Nurse.....	125 00
P. T. Doyle, Teamster.....	70 00
J. Hubbard, First Attendant.....	70 00
F. W. Schultz, Harness and Mattress Maker.....	70 00
D. L. Cobb, Musician.....	72 00
R. Gaertner, Musician.....	72 00
M. J. Hartner, Musician.....	72 00
W. N. Hazen, Musician.....	72 00
A. C. McLeod, Musician.....	72 00
L. Londerman, Storekeeper, Vegetable Room.....	73 00
J. H. Gallagher, Steamfitter's Helper.....	75 00
E. Wilson, Property Clerk.....	75 00
W. Hughes, Night Attendant.....	75 00
J. H. McPherson, Night Attendant.....	75 00
F. Peterson, Musician.....	75 00
C. Armstrong, Musician.....	75 00
T. Frederickson, Waitress.....	75 00
M. Edwards, Waitress.....	75 00
E. McConnell, Waitress.....	75 00
L. Sandlin, Waitress.....	75 00
V. Kinzer, Waitress.....	75 00
K. Matthews, Waitress.....	75 00
H. M. Kelly, Laundress.....	75 00
C. Smith, Laundress.....	75 00
M. Flood, Waitress.....	75 00

VETERANS' HOME OF CALIFORNIA—Continued.

Name of Officer or Employee and Title	Monthly Salary
T. Burkett, Waitress.....	75 00
M. Johnson, Waitress.....	75 00
F. Bone, Waitress.....	75 00
M. Hancock, Waitress.....	75 00
I. Arendt, Waitress.....	75 00
M. Bradlock, Waitress.....	75 00
A. Dettling, Waitress.....	75 00
M. Brown, Waitress.....	75 00
N. Hazelton, Waitress.....	75 00
G. Halter, Waitress.....	75 00
T. Cunningham, Waitress.....	75 00
V. Casaday, Waitress.....	75 00
C. Lightstone, Waitress.....	75 00
†A. Hugaman, Oil Caretaker.....	4 50
†J. S. Melton, Member Firing Party.....	5 00
†J. J. Freil, Pall Bearer.....	5 00
†J. Rosen, Pall Bearer.....	5 00
†G. Wulff, Pall Bearer.....	5 00
†D. Donlin, Pall Bearer.....	5 00
†W. Cagney, Pall Bearer.....	5 00
†T. J. Daley, Pall Bearer.....	5 00
†R. Harney, Dishwasher.....	6 00
G. Chatten, Sergeant Fir. Pty.....	7 50
J. Londerman, Ice Man.....	10 00
W. S. Saylor, Hog Killer.....	10 00
J. P. Schenek, Bowling Alley.....	10 00
J. Rosen, Orderly.....	10 00
J. H. Ransom, Reader.....	10 00
W. Karr, Chaplain.....	10 00
W. C. Pascoe, Flagman.....	11 00
L. Sawyer, Garbage Man.....	15 00
E. Tanner, Dump Man.....	15 00
J. P. Conolly, Janitor.....	15 00
L. B. Stephenson, Theatre.....	15 00
†F. Peterson, Bugler.....	15 00
P. Schroeder, Barber.....	15 00
W. Hatherly, Shoemaker.....	20 00
J. M. J. Lyons, Telephone Operator.....	20 00
C. W. Cummings, Crossing Sweeper.....	20 01
T. G. Sage, Member Guard.....	20 00
G. W. Olger, Member Guard.....	20 00
T. Nigh, Member Guard.....	20 00
H. Boyd, Member Guard.....	20 00
J. Corbett, Vegetable Man.....	20 00
M. Maloney, Sergeant of Guard.....	25 00
D. Dooley, Cartman.....	25 00
W. Cowan, Steam Man.....	25 00
J. Beard, Stableman.....	30 00
H. Milligan, Assistant Butcher.....	30 00
E. S. Monroe, Issue Clerk.....	30 00
J. Sammon, Laborer.....	30 00
O. Doehring, Pol. Grounds.....	30 00
T. A. Morrissey, Pol. Grounds.....	30 00
H. Rochford, Pol. Grounds.....	30 00
J. Alley, Pol. Grounds.....	30 00
B. Van Camp, Captain Company D.....	30 00
M. Davis, Captain Company F.....	30 01
L. C. McMahan, Captain Company G.....	30 00
S. L. Skeels, Captain Company F.....	30 00
E. G. Perkins, Captain Company B.....	30 01
J. P. Jones, Captain Company C.....	30 00
F. M. Smith, Captain Company A.....	30 00
T. McCarty, Night Watch.....	30 00
A. A. Sullivan, Musician.....	35 00
E. Sherwood, Musician.....	35 00
F. Muller, Musician.....	35 00
W. H. Williams, Billiard Hall.....	35 00
J. Cushing, Fatigue Sergeant.....	35 00
C. McIntyre, Food Carrier.....	35 00
T. C. Grogan, Main Orderly.....	35 00
A. H. Billings, Window Washer.....	35 00
W. Curry, Potwasher.....	35 00
L. F. Eisenbach, Musician.....	40 00
E. J. Green, Telephone Operator.....	40 00
J. Clunen, Sergeant, Charge of Quarters.....	40 00
J. McGorian, Second Attendant.....	40 00
T. F. White, Second Attendant.....	40 00
M. Doran, Second Attendant.....	40 00

†Part-time service.

VETERANS' HOME OF CALIFORNIA—Continued.

Name of Officer or Employee and Title	Monthly Salary
G. J. Price, Second Attendant.....	40 00
W. Walker, Second Attendant.....	40 00
F. Koopman, Second Attendant.....	40 00
W. T. Smith, Second Attendant.....	40 00
J. Monsinger, Second Attendant.....	40 00
T. F. Jennings, Waiter.....	40 00
C. Fales, Waiter.....	40 00
C. M. Tibbetts, Laundryman.....	40 00
J. J. Sullivan, General Utility Man.....	40 00
O. Wallenberg, General Utility Man.....	40 00
W. Smith, Dishwasher.....	40 00
G. Pile, Dishwasher.....	40 00
J. Sullivan, Dishwasher.....	40 00
G. Dickerson, Waiter.....	40 00
J. Grimes, Coffeeman.....	40 00
J. Warren, Laundryman.....	45 00
J. Miller, Head Dishwasher.....	45 00
J. Fowler, Pantryman.....	45 00
E. Ferrara, Orderly and Baggage man.....	45 00
A. Brogan, Assistant Mattress Maker.....	50 00
G. McCrory, Issue Clerk.....	50 00
C. Hughes, Hospital Steward.....	50 00
T. Ward, Pantryman.....	50 00
W. F. Payne, Kitchen Relief.....	50 00
O. R. Coulter, Dishwasher.....	50 00
T. Moran, Potwasher.....	50 00
H. Melody, Cook's Helper.....	50 00
W. D. Rea, Night Cook.....	50 00
	Daily wage
J. Claire, Carpenter.....	2 00
R. C. McConnell, Carpenter.....	2 00
J. Miller, Carpenter.....	2 00
J. Thomas, Painter.....	2 00
W. Zeller, Pruner.....	4 00
L. Hotchkiss, Tractor Driver.....	5 16
G. H. Hoppe, Pruner.....	6 16

Number of persons engaged for temporary or emergency employment during fiscal year ended June 30, 1920.....

Twenty persons, amounting to.....\$729 35

CALIFORNIA STATE BOARD OF EXAMINERS IN VETERINARY MEDICINE.

Name, Address and Title	Salary
Edw. J. Creely, 1194 Market Street, San Francisco, President.....	None*
W. W. Thomas, Merced, California, Vice President.....	None*
M. Rosenberger, Van Nuys, Treasurer.....	None*
Jno. L. Tyler, 120 E. Belgrave Avenue, Huntington Park, Cal., Secretary of Board.....	None*
John P. McKenna, 616 Eye Street, Fresno, California, Member.....	None*

Respectfully submitted: (Signed) John L. Tyler, Secretary.

120 East Belgrade Avenue, Huntington Park, California.

Expense fund is made up from fees collected from applicants for license to practice.

STATE WATER COMMISSION.

(Report of officers and regular employees employed in this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Charles H. Lee, Executive Member.....	416 65**
W. A. Johnstone, Commissioner, per diem.....	15 00**
A. W. Mason, Commissioner, per diem.....	15 00**
Paul Bailey, Hydraulic Engineer.....	400 00
L. D. Bohnett, Attorney.....	275 00
J. A. Patten, Secretary.....	275 00
Edward Hyatt, Office Engineer.....	275 00
Gordon Zander, Engineer.....	225 00
Donald M. Baker, Engineer.....	225 00
Glenn V. Rhodes, Engineer.....	200 00
G. N. Ashley, Civil Engineer.....	175 00
Alfred P. Bosworth, Hydro. Computer.....	175 00

*!Expenses of meetings allowed if sufficient funds are on hand.

*Statutory.

!Traveling expenses.

STATE WATER COMMISSION—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

Name and Title	Monthly Salary
Geo. M. Hill, Civil Engineer.....	175 00†
Adelaide Smith, Clerk.....	175 00
T. R. Simpson, Civil Engineer.....	150 00†
F. M. Kelley, Engineer.....	137 00†
Laura Pearce, Stenographer.....	135 00
Dorothy Burchard, Stenographer.....	135 00
Helen Malley, Stenographer.....	125 00
Irene Burton, Stenographer.....	100 00
Geo. E. Troxell, Engineer.....	75 00†
Grace Brough, Junior Clerk.....	60 00
Lois J. Healey, Stenographer.....	25 00†

Report of Emergency or Temporary Employees for Fiscal Year Ending
June 30, 1920.

Number of persons temporary or emergency, 10; total amount expended, \$351.57.

STATE DEPARTMENT WEIGHTS AND MEASURES.

(Report of officers and regular employees employed in this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary
Chas. G. Johnson, State Superintendent.....	\$333 30*
Chas. F. Hayden, Chief Deputy.....	150 00*
Rose Moffett, Chief Clerk.....	125 00
Mayme Sargent, Stenographer.....	125 00
Statement of persons engaged for temporary emergency employment during the fiscal year ending June 30, 1920, and total amount expended for such employment.	
A. M. Wallen, account of inspections at State Institutions during December, 1919:	
Salary, 31 days at \$5 per day, \$155.00; traveling expenses, \$141.06.....	\$296 06
J. W. Wylie, during January, 1920:	
Salary, 10 days at \$5 per day.....	50 00

WHITTIER STATE SCHOOL.

(Report of officers and regular employees employed in this department on January 1, 1921.)

\$351 to \$400.		Monthly Salary		
Name of Officer or Employee and Title		or Daily Wage	Maintenance	Total Paid
Fred C. Nelles, Superintendent.....		\$300 00*	\$100 00	\$400 00
\$251 to \$275.				
Karl M. Cowdery, Assistant Superintendent.....		225 00	50 00	275 00
\$201 to \$225.				
Edward Keasbey, Treasurer and Business Manager.....		175 00	50 00	225 00
Ralph Thynnes, Supervisor Trades.....		166 00	50 00	216 00
W. J. Anderson, Chief Supervisor.....		175 00	35 00	210 00
\$176 to \$200.				
John E. Foxlee, Chief Engineer.....		150 00	35 00	185 00
\$151 to \$175.				
Geo. Gemilere, Garage Foreman, Moving Picture Operator.....		137 50	35 00	172 50
Elmer E. Knox, Secretary.....		135 00	35 00	170 00
Frank Frei, Chef and Instructor.....		135 00	35 00	170 00
Earl Frownfelter, Assistant Chief Supervisor.....		130 00	35 00	165 00
H. E. Fleming, Printing Foreman and Instructor.....		130 00	35 00	165 00
Geo. Armstrong, Carpenter Foreman and Instructor.....		130 00	35 00	165 00
P. N. Cullen, Painting Foreman and Instructor.....		130 00	35 00	165 00
Mrs. Alice Bowman, Teacher and Librarian.....		125 00	35 00	160 00
Bess McQuiston, Senior Bookkeeper.....		125 00	35 00	160 00
Locke Livernash, Teacher and Band Master.....		125 00	35 00	160 00
Gerrit Roest, Head of Landscaps Department.....		125 00	35 00	160 00
Geo. Bessler, Baker and Instructor.....		120 00	35 00	155 00
E. A. Richter, Plumber and Instructor.....		120 00	35 00	155 00
R. T. Turner, Assistant Engineer and Electrician.....		120 00	35 00	155 00
W. W. Ward, Blacksmith and Instructor.....		120 00	35 00	155 00

†Traveling expenses.

*Statutory position.

†Part-time service.

WHITTIER STATE SCHOOL—Continued.

(Report of officers and regular employees employed by this department on January 1, 1921.)

\$126 to \$150.

Name of Officer or Employee and Title	Monthly Salary or Daily Wage	Maintenance	Total Paid
Herbert Tebbetts, School Physician.....	150 00	---	150 00
M. J. McBride, Teacher.....	115 00	35 00	150 00
Lois Osborne, Teacher.....	115 00	35 00	150 00
Helen Oscar, Teacher.....	115 00	35 00	150 00
Sally Riley, Teacher.....	115 00	35 00	150 00
Frank Laycock, Farm Foreman and Tractor Operator.....	115 00	35 00	150 00
J. E. Robbins, Sup. Rec. Co.....	115 00	35 00	150 00
W. A. Bedford, Herdsman.....	110 00	35 00	145 00
J. F. Pyles, Assistant Chef, and Dining Room Supervisor.....	110 00	35 00	145 00
Peter Smith, Commissary Man.....	110 00	35 00	145 00
C. E. Hoogerzeil, Shoemaker and Instructor.....	110 00	35 00	145 00
G. Simonsen, Carpenter.....	110 00	35 00	145 00
Pauline North, Tailor and Instructor.....	125 00	24 00	144 00
E. F. Steiger, Vacation Relief.....	100 00	35 00	135 00
Harry Vaughn, Supervisor.....	100 00	35 00	135 00
Earl G. Williams, Supervisor.....	100 00	35 00	135 00
A. McAuley, Utility Man.....	100 00	35 00	135 00
E. J. North, Laundry Man and Instructor.....	100 00	35 00	135 00
Charles Casey, Supervisor.....	100 00	35 00	135 00
Joe Dambacher, Supervisor.....	100 00	35 00	135 00
L. W. Jeffery, Supervisor.....	100 00	35 00	135 00
Ben Jones, Supervisor.....	100 00	35 00	135 00
J. H. Kampert, Head Night Supervisor.....	100 00	35 00	135 00
E. M. McBride, Relief Sup. Junior Department.....	100 00	35 00	135 00
John McCormack, Supervisor.....	100 00	35 00	135 00
Benj. Sheffer, Supervisor.....	100 00	35 00	135 00
W. D. Smith, Supervisor.....	100 00	35 00	135 00
J. T. Moore, Carpenter.....	100 00	35 00	135 00
John Morris, Milker and Instructor.....	100 00	35 00	135 00
C. B. Chilver, Book Binder and Instructor.....	95 00	35 00	130 00
F. L. Gower, Poultry Man and Instructor.....	95 00	35 00	130 00
Arthur E. Ray, Garage Man and Instructor.....	95 00	35 00	130 00
A. D. Woodruff, Pruner (average).....	130 00	---	130 00

\$101 to \$125.

Jack Branscomb, Farm Hand and Supervisor.....	90 00	35 00	125 00
F. F. Pratt, Vegetable Gardener.....	90 00	35 00	125 00
Helen Kathryn, Stenographer-Clerk.....	90 00	35 00	125 00
John Clery, Nt. Supervisor.....	85 00	35 00	120 00
Richard Denton, Nt. Supervisor.....	85 00	35 00	120 00
C. F. Eymann, Nt. Supervisor.....	85 00	35 00	120 00
E. L. Johnston, Nt. Supervisor.....	85 00	35 00	120 00
C. B. Holman, Nt. Supervisor.....	85 00	35 00	120 00
H. K. Keim, Nt. Supervisor.....	85 00	35 00	120 00
D. J. Lyons, Nt. Supervisor.....	85 00	35 00	120 00
Jas. McDonough, Nt. Supervisor.....	85 00	35 00	120 00
John Seelig, Nt. Supervisor.....	85 00	35 00	120 00
Alexander Smith, Nt. Supervisor.....	85 00	35 00	120 00
Pressley Davis, Nt. Supervisor.....	85 00	35 00	120 00
F. Throop, Nt. Supervisor.....	85 00	35 00	120 00
R. K. Wetmore, Nt. Supervisor.....	85 00	35 00	120 00
Charlotte Mathers, Surgical Nurse.....	85 00	35 00	120 00
Mrs. Jos. Dambacher, House Mother, self and one child.....	55 00	48 00	103 00
Mrs. Benj. Sheffer, House Mother, self and one child.....	55 00	48 00	103 00
Wm. C. Hicks, Orchardist and Supervisor.....	80 00	35 00	115 00
Mrs. Ada Nihoff, Stenographer.....	80 00	35 00	115 00
Mrs. Grace Wood, Stenographer-Ediphone Operator.....	80 00	35 00	115 00

\$76 to \$100

Mrs. Leona Dixon, Pantry Woman and Supervisor.....	65 00	35 00	100 00
Mrs. M. E. Elliott, Housekeeper and Supervisor.....	65 00	35 00	100 00
Mrs. C. A. Hood, Housekeeper and Supervisor.....	55 00	35 00	90 00
Lenore Vaughn, Housekeeper and Supervisor.....	60 00	24 00	84 00
Mrs. Chas. Casey, Housekeeper and Supervisor.....	55 00	24 00	79 00

\$51 to \$75.

Mande H. Hartley, Vocal Instructor.....	50 00	16 00	66 00
L. A. Pickering, Pruner (average).....	50 00	---	50 00
Lou Alvarado, Housekeeper.....	27 50	17 50	45 00
Emergency Employment, July 1, 1910-June 31, 1920 (Not substituting) 4 Persons.....	121 42	---	121 42

Total cash salaries.....	\$8,982 42	\$2,901 50	\$11,883 92
Total assumed valuation of maintenance furnished.....	---	---	\$8,982 42
Grand Total.....	---	---	\$11,883 92

†Part-time basis.

†Paid at rate of \$5 per day.

Summary of the Number and Salary of Officers and Employees in the Various Departments of the State—Departments Supported by Budget Appropriations.

	Men	
Average Monthly Salary	\$1,113	
Average Annual Salary	\$13,764	

Special Report of Employees Employed in General State Research and Parole Work; for Joint Activities of Preston and Whittier State Schools; and Engineering Work in the Destruction of Old Buildings and Erection of New Buildings on January 1, 1921.

Name of Officer or Employee and Title	Monthly Salary or Daily Wage	Maintenance	Total Paid
J. H. Williams, Research Director.....	\$351 to \$400. \$275 00	\$75 00	\$350 00
R. A. Lang, Directing Supervisor of Placement.....	\$201 to \$225. 175 00† 87 50	35 00 17 50	(1)105 00
W. W. Clark, Sociologist.....	\$176 to \$200. 150 00	35 00	185 00
W. E. Connors, Parole Officer.....	\$151 to \$175. 135 00† 67 50	35 00 17 50	(1)85 00
L. H. Brunsart, Carpenter and Instructor.....	120 00	35 00	155 00
F. A. Hanson, Painter and Instructor.....	120 00	35 00	155 00
Julia Mathews, Assistant Psychologist.....	120 00	35 00	155 00
Harry Barnes, Sup. L. P. Co.....	\$126 to \$150. 115 00	35 00	150 00
Mildred S. Covert, Field Worker.....	110 00	35 00	145 00
L. E. Nathan, Clerk, Research Department.....	105 00	35 00	140 00
J. P. Sluder, Supervisor.....	105 00	35 00	140 00
Helen E. Cook, Field Worker.....	140 00	35 00	135 00
Ethel Lane, Stenographer, Research Department.....	\$101 to \$125. 90 00	35 00	125 00
Mrs. R. A. Lang, Assistant Division of Placement.....	100 00† 50 00	24 00 12 00	(1)62 00
Total cash salaries.....	\$1,615 00	\$472 00	\$2,087 00
Total assumed valuation of maintenance furnished.....			\$1,615 00 472 00
Grand total.....			\$2,087 00

*Salary fixed by statute.

†Part-time basis.

‡One-half salary to be paid by Preston School of Industry.

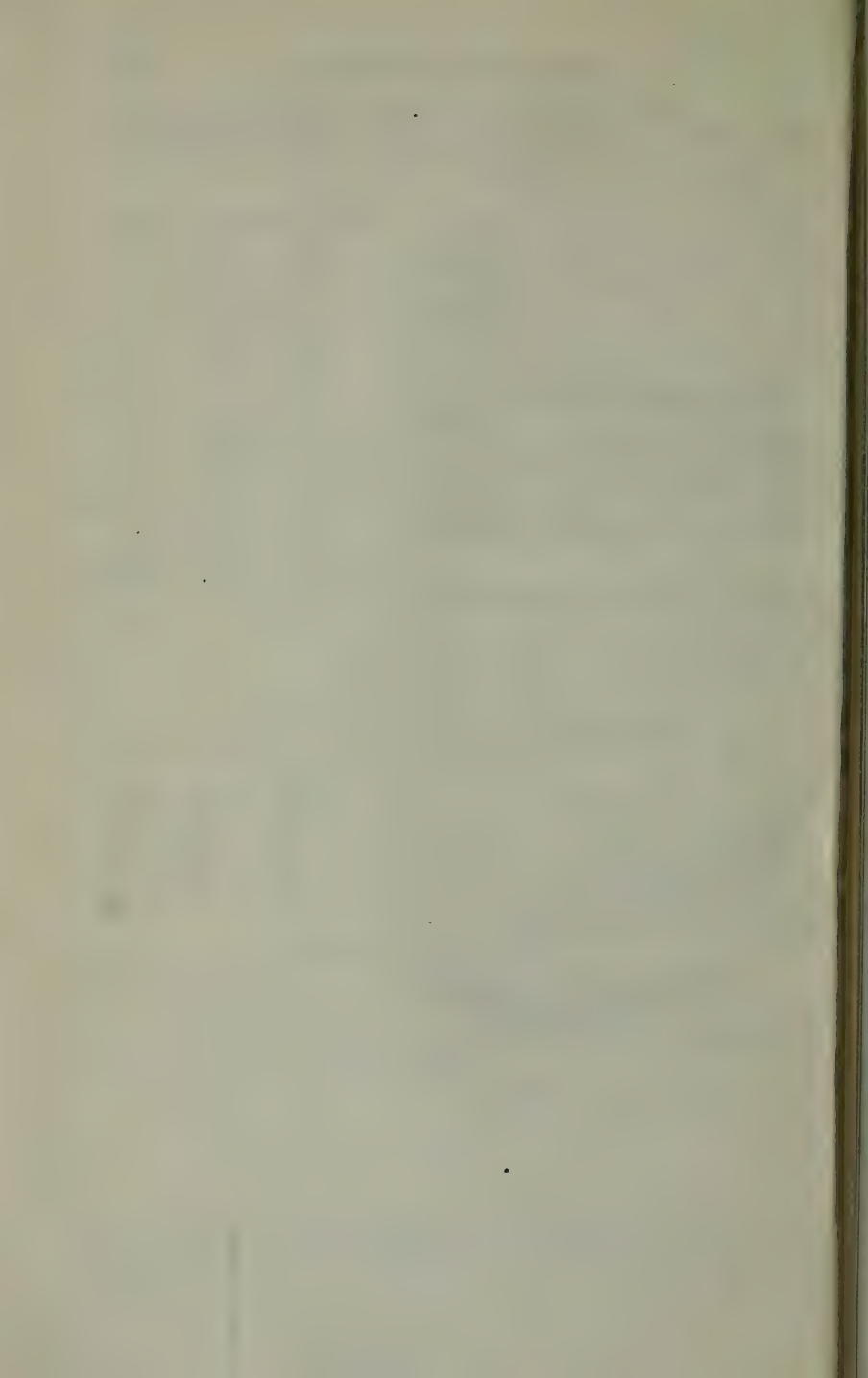
WOMEN'S RELIEF CORPS HOME OF CALIFORNIA.

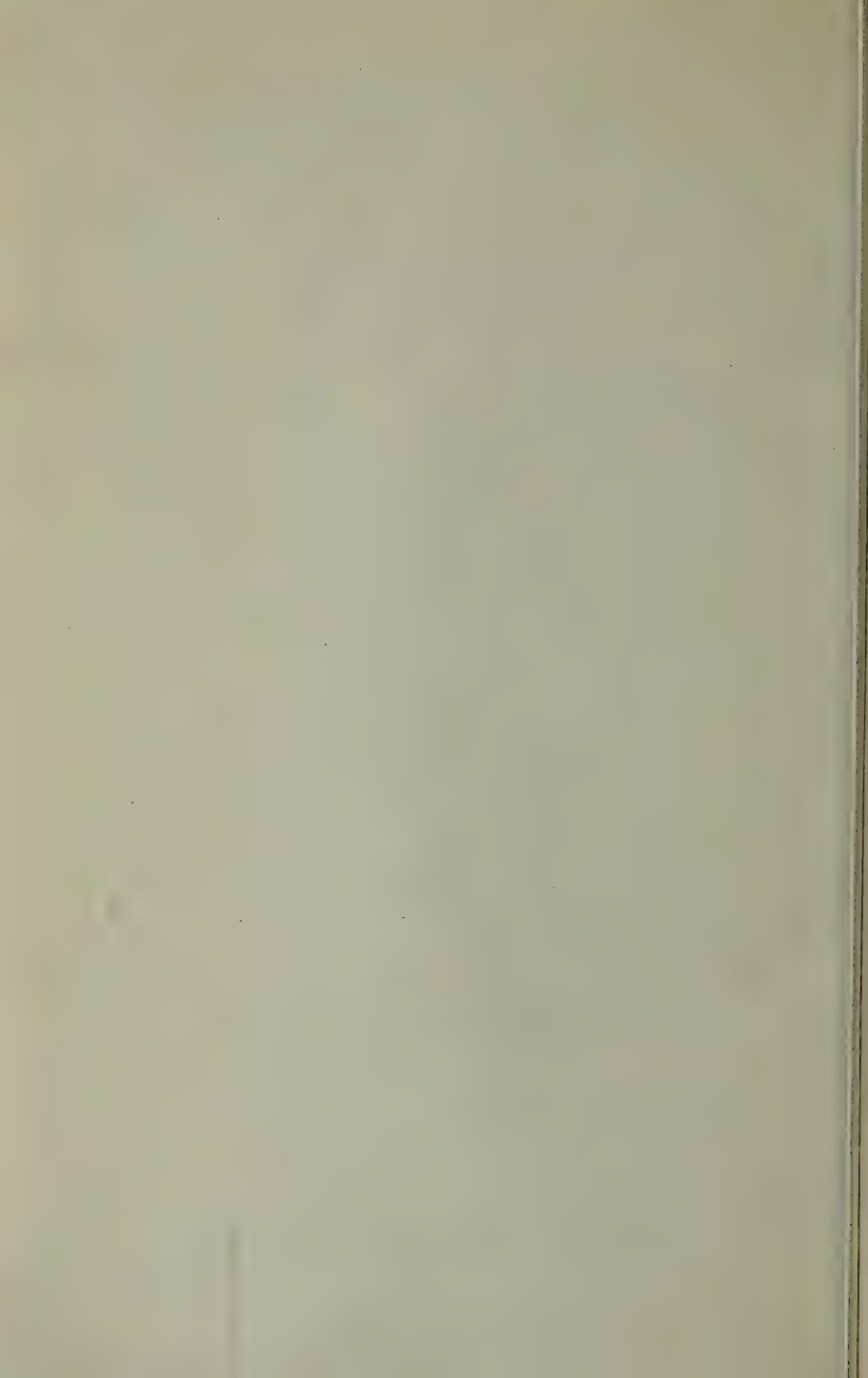
(Report of officers and regular employees employed in this department on January 1, 1921.)

Name of Officer or Employee and Title	Monthly Salary or Daily Wage	Maintenance	Total Paid
Alice Arthur, Matron.....	\$75 00	\$35 00	\$110 00
Edward Arthur, Gardener.....	75 00	35 00	110 00
Mrs. B. P. Fuller, Cook.....	75 00	35 00	110 00
Mae Burke, Second Girl.....	60 00	35 00	95 00
Dorothy Mogensen, Nurse.....	60 00	35 00	95 00
Lillian Ogden, Night Nurse.....	50 00	35 00	85 00
Cora Fenner, Seamstress.....	50 00	35 00	85 00
Sarah J. Farwell, Secretary and Director.....	25 00*		25 00*
Carrie L. Hoyt, Treasurer and Director.....	25 00*		25 00*
Temporary or Emergency Employment.			
Dr. R. F. Wayland, Physician, 112 visits at \$5.....			\$560 00
Extra Nurse, 12 days at \$5, \$60; maintenance, \$14.....			74 00
Arthur Manning, Laborer, 8 days at \$3.50.....			28 00
Vera Cookson, Labor, 2 days at \$2.50.....			5 00
Mary Johnson, Labor, 2 days at \$2.50.....			5 00

Respectfully submitted: Sarah J. Farwell, Secretary.

*Five directors receive no compensation.





FOURTH BIENNIAL REPORT

OF THE

California State Civil Service Commission

TO THE GOVERNOR

JANUARY 12, 1921



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1921

COMMISSIONERS

DAVID J. REESE, President

EDGAR WILLIAMS

CHARLES WESLEY REED

NOVA J. BEAL,
Secretary

JULIAN C. WHITMAN,
Chief Examiner

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FOURTH BIENNIAL REPORT OF THE STATE CIVIL SERVICE COMMISSION TO THE GOVERNOR

*To the Honorable WILLIAM D. STEPHENS,
Governor of the State of California,
State Capitol, Sacramento.*

DEAR SIR: The Civil Service Commission has the honor to submit herewith its fourth biennial report and suggestions pursuant to section 5, subdivision 8 of the Civil Service Law.

On November 1, 1918, there were 5296 employees in the state service exclusive of employees of the office of the Governor, the Railroad Commission, the University of California, the normal schools, the teachers of secondary, trades and technical schools, and the state prisons. Of this number 4743 were in the classified service. On December 1, 1920, there were 6752 employees in the state service, with the exceptions mentioned above; of this number 6161 were in the classified service, an increase of twenty-seven per cent during the biennial period.

From July 1, 1918 to June 30, 1920, 430 examinations were held, an increase of twenty per cent over the number held during the preceding biennial period. Although the war closed in November, 1918, the number participating in these examinations was 4699, or forty per cent less than the total number of persons examined in the preceding biennial period. This reveals the interesting and remarkable fact that the abnormal conditions resulting from the war and causing an unprecedented demand for help, both male and female, in all departments of industrial and commercial life, were more acute after than during the war. Thus with the twenty per cent increase in the number of examinations, there was a decrease of twenty-three per cent in the number of applicants recruited for our eligible lists since the return of peace, as compared with the number secured during the war period biennial, or from 1916 to 1918.

In the face of these abnormal conditions affecting the labor market, the Civil Service Commission has secured for the various departments and institutions of the state since the last report, 2527 persons, or $38\frac{3}{10}$ per cent of the total since the first examination held in December, 1913.

The turnover of our skilled and unskilled labor during the biennial period, owing to the continued abnormal conditions, has been large, so that the total number of persons employed under temporary appointment authorization has been 11,794. At the present time there are 3011 persons employed in the state under temporary authorization pending examinations. Of those who held positions under temporary authorization fifty per cent of the total were for institutional, highway and engineering work where the turnover is exceedingly large and the positions involved are largely of the unskilled labor class. At the time this report goes to press, the change in business conditions is seen in the industrial world particularly, and the number of those applying to take examinations for skilled and unskilled labor positions is showing material increase, which we hope will result in a corresponding decrease in the number of appointments under temporary authorization.

In our report of December 20, 1916, (second biennial) this statement was made: "This Commission plans a more comprehensive classification of the service than has been heretofore possible. This classification will, when complete, give for the 276 different kinds of positions the following information: 1. Description of duties and illustrative examinations; 2. Requirements (*a*) education (*b*) experience (*c*) special knowledge (*d*) personal characteristics; 3. Compensation."

In our report of December 23, 1918 (third biennial) it was stated that "a beginning has been made in the work of standardization at the state hospitals, where definite salary schedules, with maximum and minimum amounts, have been adopted. It is the desire of the Commission to continue this work and thus cover the entire state service as rapidly as possible. Correlated with the standardization of salaries is the establishment of minimum requirements for entrance into the various classes of positions in the service. These specifications are being prepared and standard tests of fitness established."

We now report that nearly all the work of standardizing the classified service and revising the present classification has been completed. We are glad to acknowledge the effective cooperation of the Board of Control, without whose help this work could not have been undertaken.

The State Civil Service Commission is required by law to make suggestions to the Governor before each session of the Legislature "for the more effectual accomplishment of the purposes of this Civil Service Act."

The Civil Service Commission earnestly recommends to you the importance of an amendment to the constitution embodying the essential principles of civil service reform. Although the Legislature attempted to place the prisons under the jurisdiction of the Commission, the Attorney General has ruled that the employees of the prisons are exempt because of a provision of the constitution itself providing that all employees of the prisons shall be appointed by the warden. At previous sessions of the Legislature many bills were presented which aimed at the integrity of the Civil Service Law. The result of this class of legislation is to arouse in all civil service employees the fear that the reign of the spoilsman will some day return to California and to cause them to feel that it is unwise for them to devote their lives to the service of the state. The Southern California Civil Service Reform League and the Commonwealth Club of California have, after many years of effort, produced a constitutional amendment which they urge you to submit to the Legislature. The Civil Service Commission has worked with these bodies in its preparation and most earnestly joins with them in the effort to secure its adoption. It appears as an appendix to this report. We make this single suggestion because we feel that its realization is essential to the welfare and perpetuity of civil service reform in the State of California.

Respectfully submitted.

DAVID J. REESE

President

EDGAR WILLIAMS

CHARLES W. REED

Commissioners.

January 12, 1921.

FINANCIAL STATEMENT.

Seventieth and Seventy-first Fiscal Years.

	Seventieth fiscal year. 1918-1919	Seventy-first fiscal year. 1919-1920
Appropriation	\$35,000 00	\$35,600 00
Balance forward from sixty-ninth fiscal year.....	330 36	
Supplemental appropriation seventieth fiscal year.....	631 09	
Totals	\$35,961 45	\$35,000 00
Expenditures	35,750 27	34,255 13
Balances	\$201 18	\$744 87

Distribution of Expenditures.

	Seventieth fiscal year. 1918-1919	Seventy-first fiscal year. 1919-1920
Office salaries	\$15,105 07	\$14,965 21
General administration	278 62	349 40
General traveling (commissioners)	1,765 59	2,065 99
Sacramento office incidental expense	796 52	959 80
Los Angeles office rental and service	600 00	600 00
Postage	1,171 12	1,058 65
Printing	1,660 18	620 35
Furniture and equipment	359 83	426 07
Examinations	969 54	1,297 63
Standardization and classification	4,043 25	2,911 98
Commissioners' salaries	9,000 00	9,000 00
Totals	\$35,750 27	\$34,255 13

Distribution of Expenditures, Showing the Relative Amount Spent for Salaries and Other Expenses.

	Seventieth fiscal year. 1918-1919		Seventy-first fiscal year. 1919-1920	
	Annual salary	Other expenses	Annual salary	Other expenses
(a) Examination division	\$4,803 45	\$1,569 54	\$5,236 12	\$1,897 68
(b) Certification division	1,117 58		1,301 29	
(c) Payroll division	1,186 46		991 67	
(d) Administrative division	16 998 18	6,031 81	16,386 13	5,480 26
(e) Standardization division	3,467 82	575 43	2,655 96	256 03
Totals	\$27,573 49	\$8,176 78	\$26,621 16	\$7,633 97

POSITIONS EXEMPTED FROM PROVISIONS OF THE CIVIL SERVICE ACT BY RESOLUTION OF THE COMMISSION.

From July 1, 1918 to June 30, 1920.

<i>Department.</i>	<i>Position.</i>	<i>Reasons for Exemption.</i>	<i>Names of Incumbents.</i>
DEPARTMENT OF AGRICULTURE, DIVISION OF ANIMAL INDUSTRY.	All resident cattle inspectors of the Office of Cattle Protection except those employed regularly on a monthly basis.	The work is of an intermittent character and necessitates the authorization of a large number of temporary appointments, approximately 100 a month, which result in a congestion of the civil service records.	Owing to the limited tenure of employment and the heavy turnover resulting therefrom, the Department of Agriculture has not been required to report appointments made under this exemption.

APPENDIX.

PROPOSED CONSTITUTIONAL AMENDMENT.

ARTICLE XXIV.

CIVIL SERVICE.

SECTION 1. Appointments and promotions in the civil service of the state shall be made according to merit and fitness, to be ascertained, so far as practicable, by examinations which, so far as practicable, shall be competitive, and tenure shall be during good behavior.

SEC. 2. The Governor shall appoint a state civil service commission of three members who shall enforce the provisions of this article and the laws enacted thereunder. The terms of the commissioners shall be six years, except that the term of the commissioners first appointed shall expire July 1, 1924, July 1, 1926, and July 1, 1928, respectively. Members of the commission shall hold office until their successors are appointed and qualified. They may be removed in the same manner as elective officers and not otherwise. The salaries of the commission shall be fixed by the legislature. The legislature may establish qualifications for the office of commissioner, and may in its discretion provide by law for the selection of civil service commissioners according to merit and fitness to be determined by competitive examination, and the successors of the commissioners then holding office shall, upon the expiration of their respective terms, be appointed in accordance with such law.

SEC. 3. No payrolls nor claims for salaries or wages of persons appointed to offices or positions in the civil service shall be paid unless the commission shall have certified that the persons named therein have been appointed or employed and have performed service in accordance with law.

SEC. 4. The commission herein provided for is hereby empowered to, and said commission shall, prescribe, amend and enforce rules not inconsistent herewith, which shall include among other things provisions for—

1. Classification of the service;
2. Determination by the commission of the practicability of holding examination;
3. Public advertisement of examinations;
4. Acceptance or rejection of candidates;
5. Holding of examinations;
6. Creation of eligible lists;
7. Certification of eligibles;
8. Appointments, probationary service, promotions, demotions, transfers, leaves of absence, suspensions, dismissals and reinstatements.

SEC. 5. The legislature shall enact appropriate legislation for the enforcement of this article and shall provide—

(a) A continuing appropriation for the work of the commission of not less than one per cent of the annual salary roll of the civil service within the jurisdiction of the commission.

(b) With the consent of any political subdivision of the state for administering its civil service laws by the state civil service commission.

SEC. 6. This article shall apply to all appointees of the state, except: (1) Commissioners and directors serving as heads of executive departments, appointed by the governor, and the employees in the governor's office; (2) persons employed by the University of California; the state normal schools and the teaching force of the elementary, secondary, trades and technical schools; (3) the state militia; (4) one deputy and one secretary to each officer, board or commission acting as a head of a department of government. The existing civil service laws, in so far as they are not in conflict with this article shall be deemed valid until amended or superseded. The legislature may, notwithstanding these provisions, require any of the excepted positions named in this section to be filled in accordance with the provisions of section one. Nothing herein shall be construed to prevent the civil service commission from providing suitable credits for persons honorably discharged from the military or naval service of the United States.

TABLE No. 1.

Table Showing Status and Number of Employees in the Service of the State
December 1, 1920.

Department	Exempt	Original employees	Taken from eligible lists	Appointed under temporary authorization	Total
1. Accountancy, Board of	5				5
2. Adjutant General	9				9
3. Advisory Pardon Board	6				6
4. Agricultural Association, Sixth District	8		7	6	21
5. Agricultural Society	13	1	2	24	40
6. Agriculture, Department of	7	8	69	68	152
7. Architecture, Board of	5			1	6
8. Attorney General	12	4	3	1	20
9. Banking Department	3	6	10	15	34
10. Building and Loan Commissioner	2	1	1		4
11. Capital Planning Commission	3				3
12. Capitol Building and Grounds, Superintendent of	6	21	26	1	54
13. Charities and Corrections, Board of	8	1	3	10	22
14. Civil Service Commission	4		15		19
15. Colton Hall Trustees, Board of	3				3
16. Control, Board of	12	3	48	9	72
17. Controller	12	9	23	3	47
18. Corporations, Commissioner of	2	1	25	15	43
19. Court of Appeals, First District (Divisions 1 and 2)	13	2	4		19
20. Court of Appeals, Second District (Divisions 1 and 2)	11	3	2		16
21. Court of Appeals, Third District	7	2	3		12
22. Criminal Identification and Investigation, Bureau of	3		9	2	14
23. Deaf and Blind, School for	5	29	1	71	106
24. Dental Examiners, Board of	7			7	14
25. Dental Surgeon	1				1
26. Education, Board of (see Superintendent of Public Instruction)	8				8
27. Embalmers, Board of	5				5
28. Engineering, Department of	9	21	74	330	434
29. Equalization, Board of	6	2			8
30. Fish and Game Commission	4	57	18	102	181
31. Forestry, Board of	7		11		18
32. Girls, California School for	6		10	39	55
33. Harbor Commissioners for Port of Eureka	5				5
34. Harbor Commissioners for Port of San Diego	3				3
35. Harbor Commissioners for Port of San Jose	3				3
36. Harbor Commissioners, Board of State	6	195	189	61	451
37. Health, Board of	20	12	46	33	111
38. Highway Commission	2	49	232	492	775
39. Historical Survey Commission	5		2	3	10
40. Hospitals, Superintendent of State	3	4	1	1	9
41. Hospital, Agnews State	7	49	72	89	217
42. Hospital, Mendocino State	7	22	55	73	157
43. Hospital, Napa State	7	83	116	176	381
44. Hospital, Norwalk State	7		42	79	128
45. Home, Sonoma State	7	49	58	89	203
46. Hospital, Southern California State	7	40	125	92	264
47. Hospital, Stockton State	7	80	122	105	314
48. Immigration and Housing Commission	7	1	14	3	25
49. Industrial Accident Commission	12	5	99	23	139
50. Industrial Farm for Women	6			1	7
51. Industrial Home for Adult Blind	6	3	2	27	38
52. Industrial Welfare Commission	6		13	21	40
53. Insurance Commissioner	3	5	3	6	17
54. Insurance Fund, Compensation	1		170	66	237
55. Irrigation Board	3				3
56. Labor Statistics, Bureau of	3	8	43	18	72
57. Land Settlement Board	8		7	281	246

TABLE No. 1.—Continued.

Table Showing Status and Number of Employees in the Service of the State
December 1, 1920.

Department	Exempt	Original employees	Taken from eligible lists	Appointed under temporary authorization	Total
58. Legislative Counsel Bureau	2		2	10	14
59. Library, California State Lunacy, Commission in (see Superintendent of State Hospitals)	8	13	21	33	75
60. Market Commission	2	1	5	10	18
61. Marshall's Monument, Guardian of	1				1
62. Medical Examiners, Board of	12	1	6	16	35
63. Mining Bureau	9	5	19	31	64
64. Monterey Custom House, Board of Trustees	5				5
65. Motor Vehicle Department	2	2	158	87	249
66. Optometry, Board of Examiners in	3				3
67. Pacific Colony	6			3	9
68. Pharmacy, Board of	8	4	1	10	23
69. Pilot Commissioners for Harbor of San Diego, Board of	3				3
70. Pilot Commissioners for San Francisco, Mare Island and Benicia, Board of	4				4
71. Pio Pico Mansion Trustees, Board of	3				3
72. Polytechnic School, California	42	1	1	21	65
73. Port Officer, San Pedro Harbor	1				1
74. Port Warden, San Francisco	1				1
75. Preston School of Industry	5	10	16	73	104
76. Printing, Superintendent of State	2	67	64	47	180
77. Prison Directors, Board of	11	1			12
78. Public Instruction, Superintendent of	7	2	24	6	39
79. Purchasing Department	2	4	22	5	33
80. Real Estate Commissioner	2		12	18	32
81. Reclamation Board	8	1	18	42	69
82. Redwood Park Commission	5	1		5	11
83. Secretary of State	3	17	3	27	50
84. Supreme Court of California	21	11	4		36
85. Surveyor General	3	4	4		11
86. Sutter Fort Trustees, Board of	6	2	1	1	10
87. Treasurer	2	9		5	16
88. Veterans' Home of California	8	9	17	75	109
89. Veterinary Medicine, Board of Examiners in	4				4
90. Water Commission	15	1	8	21	45
91. Weights and Measures, Superintendent of	2		2		4
92. Whittier State School	4	9	11	78	102
93. Women's Relief Corps Home Association	6				6
Totals	591	956	2,194	3,011	6,752
Under civil service jurisdiction					591
					6,161

TABLE No. 2.
 Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1918, to July 1, 1919.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Total per cent passed, men and women	Number failed		Per cent failed	Total per cent failed, men and women
		Men	Women	Men	Women		Men	Women		Men	Women		
1. Assistant to Superintendent, Bureau of Criminal Identification and Investigation.	Mar. 8, 1919	4		4		100.0	1		25.0	3		75.0	75.0
2. Attendant, Agnew's State Hospital.	April 1, 1919	91	23	90	16	91.8	17	15	88.8	3	1	15.0	11.1
3. Attendant, Mendocino State Hospital.	April 1, 1919	13	11	11	8	76.1	10	8	90.9	1	1	9.0	6.7
4. Attendant, Napa State Hospital.	April 1, 1919	31	29	29	24	83.4	25	17	86.2	4	7	13.3	29.7
5. Attendant, Norwalk State Hospital.	April 1, 1919	16	19	12	12	65.3	8	12	100.0	100.0			
6. Attendant, Sonoma State Home.	April 1, 1919	8	17	8	15	92.0	3	13	100.0	86.7	2	13.3	8.6
7. Attendant, Southern California State Hospital.	April 1, 1919	27	33	26	31	95.0	23	31	88.4	100.0	1	3.1	5.2
8. Attendant, Stockton State Hospital.	April 1, 1919	33	37	32	34	94.2	31	33	96.8	97.0	3	2.9	3.0
9. Auditor	Oct. 1, 1918	6		6		100.0	3		100.0	3		50.0	50.0
10. Auditor	Jan. 1, 1919	1		1		100.0							
11. Auditor	April 1, 1919	8		7		87.5	3		42.8	4		57.2	57.2
12. Automobile truck driver.	May 17, 1919	24		23		95.8	18		74.2	5		21.2	21.8
13. Bailiff, Supreme and Appellate Courts.	April 26, 1919	53		50		94.3	41	2	82.0	9		28.0	28.0
14. Bindery worker (female)	Oct. 12, 1918		4		4	100.0			50.0		2	50.0	50.0
15. Blacksmith and helper.	April 1, 1919	9		9		100.0	8		88.8			11.2	11.2
16. Bookkeeper	April 1, 1919	3		2		66.7				2		100.0	100.0
17. Bookkeeper, junior	Sept. 7, 1918	1		1		100.0		1	100.0			50.0	50.0
18. Bookkeeper, junior	Jan. 4, 1919	2		2		100.0							
19. Bookkeeper, junior	May 3, 1919	4		3		75.0							
20. Bookkeeper, senior	Sept. 7, 1918	5		4		80.0	2		40.0	3		60.0	60.0
21. Bookkeeper, senior	Jan. 4, 1919	12		10		83.3	3		30.0	9		75.0	75.0
22. Bookkeeper, senior	May 3, 1919	7		6		85.7	2		33.3	4		57.1	57.1
23. Bookkeeper, California School for Girls	May 3, 1919	2		2		100.0			100.0			100.0	100.0
24. Bricklayer	Aug. 26, 1918	7		5		71.4			100.0				
25. Business agent, State Board of Control.	April 19, 1919	16		15		93.7	6		40.0	9		60.0	60.0
26. Butcher, Preston School of Industry.	Mar. 15, 1919	1		1		100.0			100.0				
27. Cable splicer	Feb. 1, 1919	1		1		100.0			100.0				
28. Captain of nightwatch, Preston School of Industry	Mar. 15, 1919	2											
29. Carpenter	Oct. 1, 1918	7		5		71.4	4		80.0			20.0	20.0
30. Carpenter	April 1, 1919	27		26		96.2	15		57.6	11		42.4	42.4
31. Carpenter, foreman	Oct. 1, 1918	8		8		100.0	5		62.5	3		37.5	37.5
32. Carpenter, California School for Girls.	May 3, 1919			1		100.0			100.0				
33. Carpenter, Preston School of Industry.	Mar. 15, 1919	1		1		100.0			100.0				
34. Clerk, general	July 20, 1918	13		10		88.3	2		20.0	8		62.2	62.2
35. Clerk, general	Dec. 14, 1918	12		11		91.6	1		9.0	10		83.3	83.3
36. Clerk, general	April 19, 1919	32		22		68.7	2		9.0	20		62.5	62.5
37. Clerk, chief	July 13, 1918	21		20		95.2	8		40.0	12		56.2	56.2

33.	Clerk, chief	Oct. 12, 1918	17	25	14	33	94.0	8	3	57.1	9.0	23.4	6	30	42.9	91.0	76.3
34.	Clerk, chief	Jan. 11, 1919	27	18	22	22	82.2	9	8	59.1	53.3	45.9	13	7	59.1	54.1	54.1
35.	Clerk, chief (promotional)	April 12, 1919	32	37	28	35	91.3	4	7	14.6	20.0	17.4	24	28	85.4	80.0	82.6
36.	Clerk, chief (promotional), Commission of Horticulture	July 13, 1918	2		2	3	100.0	1		50.0			1	3	50.0	100.0	80.0
37.	Clerk, legislative bill filing	Dec. 28, 1918		1		3	100.0		1		100.0	100.0					
38.	Clerk, commissary, California School for Girls	Oct. 12, 1918	1	23	1	22	95.8		14		63.6	58.3	1	8	100.0	38.4	41.7
39.	Clerk, placement	May 3, 1919		1		1	100.0		1		100.0	100.0					
40.	Clerk, rate	April 1, 1919	49	47	40	43	80.5	29	23	70.2	53.5	60.4	11	20	29.8	46.5	39.6
41.	Clerk, rate, chief	Oct. 26, 1918	1	79	1	71	90.0		27		38.0	33.7	1	44	100.0	66.3	66.3
42.	Clerk-stenographer, Corporation Department (promotional)	Oct. 10, 1918	1	20	1	18	90.4		8		100.0	44.4		10		55.6	52.8
43.	Clerk-stenographer, Highway Com. (promotional)	Dec. 21, 1918		2		2	100.0		1		50.0	50.0		1		50.0	50.0
44.	Company captain, Preston School of Industry	Dec. 28, 1918		3		2	66.7		1		50.0	50.0		1	100.0	50.0	100.0
45.	Company captain, Preston School of Industry	July 10, 1918		1		1	50.0				75.0			1	25.0		25.0
46.	Company captain, Preston School of Industry	Mar. 15, 1919	10	8		80.0		6			100.0			2			
47.	Company captain, assistant, Preston School of Industry	June 1, 1919	3	3	3	100.0		3			100.0						
48.	Cook (coottage)	July 8, 1918	1		1		100.0		1		100.0						
49.	Cook (coottage)	Mar. 1, 1919	3		2	65.7		1	1		50.0	50.0		1		50.0	50.0
50.	Cook, chef, Preston School of Industry	May 1, 1919	1		1	100.0		1	1		100.0	100.0					
51.	Copyholder	Oct. 12, 1918	7		7	100.0		7			100.0	100.0					
52.	Dairymen	April 1, 1919	6		5	83.3		3			60.0			2	40.0	40.0	40.0
53.	Dairymen, Preston School of Industry	Mar. 15, 1919	4		3	75.0		2			63.7			1	33.3	33.3	33.3
54.	Delineator, junior	June 23, 1919	1		1	100.0								1	100.0	100.0	100.0
55.	Delineator, senior	June 23, 1919	21		20	95.2		13			65.0			7	35.0	35.0	35.0
56.	Dictaphone operator	April 5, 1919		1		1	100.0		1		100.0	100.0		1		50.0	50.0
57.	Dining room officer, Preston School of Industry	July 8, 1918	1	2		63.7			1		100.0						
58.	Ditch tender, Preston School of Industry	Mar. 15, 1919	13		1	100.0			8		72.7			3	27.3	27.3	27.3
59.	Dormitory nightwatch, Preston School of Industry	Mar. 15, 1919	4	2	2	50.0			1		50.0			1	50.0	50.0	50.0
60.	Dormitory nightwatch, Preston School of Industry	June 1, 1919	4		11	100.0		10			90.9			9.1		9.1	
61.	Draftsman, engineering, junior	June 19, 1919	24		22	91.7		14			63.6			8	36.4	36.4	36.4
62.	Draftsman, engineering, senior	June 20, 1919	24		1	100.0		1			100.0						
63.	Draftsman, electrical engineering, junior	June 27, 1919	15		4	80.0		1			25.0			3	75.0	75.0	75.0
64.	Draftsman, electrical engineering, senior	June 27, 1919	5	2	4	2	85.7	4	1		100.0	50.0		1	83.3	83.3	83.3
65.	Draftsman, electrical engineering, junior and senior	Mar. 8, 1919	1		1	100.0					65.7			1			
66.	Draftsman, geological, junior	June 28, 1919	1	1	3	100.0		2			75.0			3	33.3	33.3	33.3
67.	Draftsman, mechanical, junior	June 27, 1919	3	3	3	100.0		2			68.7			1			
68.	Draftsman, mechanical, senior	June 27, 1919	3	3	3	100.0		2			75.0			3	33.3	33.3	33.3
69.	Druggist	June 27, 1919	4	4	4	100.0		3			75.0			1			
70.	Electrical foreman	Dec. 28, 1918	7	7	7	100.0		4			25.0			1	75.0	25.0	25.0
71.	Electrical foreman	Sept. 15, 1918	4	4	4	100.0		4			57.1			3	42.9	42.9	42.9
72.	Electrician	Feb. 1, 1919	5	2	4	80.0		1			25.0			3	75.0	75.0	75.0
73.	Electrician	Feb. 1, 1919	2	2	2	100.0								2	100.0	100.0	100.0
74.	Electrician, institutional	Sept. 15, 1918	1	1	1	100.0			1		100.0			1	100.0	100.0	100.0
75.	Electrician, Preston School of Industry	July 8, 1918	1	1	1	100.0											
76.	Electrician, Preston School of Industry	Mar. 15, 1919	4	4	2	50.0		2			100.0						
77.	Elevator operator	April 24, 1919	64		55	90.6		27			60.0			18	40.0	40.0	40.0
78.	Engineer, civil, I	June 20, 1919	57		48	78.9		29			50.0			50.9	50.0	50.0	50.0
79.	Engineer, civil, II (construction engineer)	June 21, 1919	19		19												

TABLE No. 2—Continued.
 Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1918, to July 1, 1919.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Total per cent passed, men and women	Number failed		Per cent failed	Total per cent failed, men and women
		Men	Women	Men	Women		Men	Women		Men	Women		
85. Engineer, civil, IV	June 14, 1919	34		28		82.3	21		75.0	7		25.0	25.0
86. Engineer, State Corporation Department	Dec. 14, 1918	13		13		100.0	1		33.3	2		66.7	66.7
87. Engineer, assistant division, Highway Com.	Aug. 24, 1918	13		13		100.0	1		7.6	12		92.4	92.4
88. Engineer, locomotive (promotional)	Oct. 5, 1918	2		2		100.0	1		50.0	1		50.0	50.0
89. Engineer, locomotive (promotional)	Jan. 1, 1919	1		1		100.0				1		100.0	100.0
90. Engineer, mechanical, Bureau of Architecture, Department of Engineering	April 5, 1919	2		2		100.0			100.0				
91. Engineer, mechanical, Department of Safety, Industrial Accident Commission	Mar. 8, 1919	6		6		100.0	4		66.7	2		33.3	33.3
92. Engineer, stationary	Nov. 23, 1918	12		8		75.0	6		75.0	2		25.0	25.0
93. Engineer, stationary, assistant	Nov. 1, 1919	10		7		70.0	4		57.1	3		42.9	42.9
94. Engineer, California School for Girls	May 3, 1919	2											
95. Engineer, Preston School of Industry	Mar. 15, 1919	7		7		100.0	2		28.5	5		71.5	71.5
96. Engineering assistant	June 19, 1919	18		15		83.3	10		63.7	5		33.3	33.3
97. Examiner, State Corporation Department	Jan. 4, 1919	19		14		60.0	4		28.5	10		71.5	73.4
98. Farmer, California School for Girls	May 3, 1919		2										
99. Farm supervisor, Preston School of Industry	Mar. 15, 1919	8		8		100.0	3		37.5	5		62.5	62.5
100. Field deputy, Commission of Horticulture	Mar. 21, 1919	6		5		83.3	4		80.0	1		20.0	20.0
101. Fireman, locomotive	Oct. 5, 1918			1		50.0	1		100.0				
102. Fireman, locomotive	Jan. 1, 1919			3		100.0							
103. Fireman, locomotive	April 1, 1919	5		5		100.0	2		66.7	1		33.3	33.3
104. Gardener, landscape	April 1, 1919	6		5		83.3	3		60.0	1		40.0	40.0
105. Goat herder, California School for Girls	May 8, 1919		2			100.0			50.0	2		50.0	50.0
106. Hollerith key punch operator	Dec. 7, 1918		3			100.0	1		100.0				
107. Hollerith tabulating machine operator	Dec. 7, 1918		4			75.0	3		100.0				
108. Housekeeper, Preston School of Industry	July 8, 1918		3			100.0	3		100.0				
109. Housekeeper, Preston School of Industry	Mar. 15, 1919		3			100.0	3		100.0				
110. Housemother, Preston School of Industry	July 8, 1918		5			100.0	4		80.0				
111. Inspector, apple packing	July 1, 1918		12			100.0	8		66.7				
112. Inspector, boiler, Industrial Accident Commission	Sept. 28, 1918		10			90.0	2		22.2	7		77.8	77.8
113. Inspector, elevator, Industrial Accident Commission	June 14, 1919		11			90.9	4		40.0	6		60.0	60.0
114. Inspector, quarantine, Commission of Horticulture	Mar. 20, 1919		5			80.0	1		25.0	3		75.0	75.0
115. Instructor in carpentry, Preston School of Industry	July 8, 1918		1			100.0	1		100.0				
116. Instructor in farming, Preston School of Industry	Mar. 15, 1919		3			100.0	1		33.3	2		66.7	66.7

117. Instructor in plumbing, Preston School of Industry	Mar. 15, 1919	1	1	1	100.0	1	100.0	100.0	100.0	100.0	12	50.0	50.0
118. Janitor	Nov. 1, 1918	27	24	88.8	12	88.8	50.0	50.0	50.0	50.0	1	10.0	10.0
119. Janitor	Jan. 15, 1919	12	10	83.3	9	83.3	90.0	90.0	90.0	90.0	1	10.0	10.0
120. Laboratory helper, Bureau of Sanitary Engineering, State Board of Health.	July 25, 1918	3	2	66.7	2	66.7	100.0	100.0	100.0	100.0	2	18.2	18.2
121. Laundryman	Mar. 1, 1918	1	11	92.3	9	92.3	81.8	100.0	83.3	83.3	2	18.2	18.2
122. Lineman	Sept. 15, 1918	12	3	100.0	2	50.0	68.7	68.7	68.7	68.7	1	33.3	33.3
123. Linotype operator	Oct. 12, 1918	3	3	100.0	2	50.0	68.7	68.7	68.7	68.7	1	33.3	33.3
124. Machinist	April 1, 1919	2	1	50.0	1	50.0	44.4	44.4	44.4	44.4	5	55.6	55.6
125. Machinist, helper	May 3, 1919	10	1	90.0	1	90.0	100.0	100.0	100.0	100.0	1	50.0	50.0
126. Marron, California School for Girls.	June 27, 1919	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
127. Marron, Sonoma State Home.	July 6, 1918	2	1	75.0	1	75.0	100.0	100.0	100.0	100.0	1	50.0	50.0
128. Messenger	July 8, 1918	2	1	50.0	1	50.0	100.0	100.0	100.0	100.0	1	50.0	50.0
129. Messenger	Aug. 3, 1918	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
130. Messenger	Oct. 5, 1918	1	4	60.0	3	60.0	100.0	100.0	100.0	100.0	1	50.0	50.0
131. Messenger	Nov. 2, 1918	1	2	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
132. Messenger	Dec. 7, 1918	1	2	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
133. Messenger	Feb. 1, 1919	1	3	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
134. Messenger	Mar. 1, 1919	1	3	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
135. Messenger	Apr. 5, 1919	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
136. Messenger	June 7, 1919	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
137. Messenger	June 3, 1919	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
138. Nightwatch, California School for Girls.	Oct. 1, 1918	3	2	66.7	2	66.7	100.0	100.0	100.0	100.0	1	50.0	50.0
139. Nurse	May 3, 1919	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
140. Nurse, California School for Girls.	May 3, 1919	1	40	95.1	39	95.1	41.0	41.0	41.0	41.0	23	59.0	59.0
141. Nurse, Public Health.	June 23, 1919	2	2	100.0	2	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
142. Physical director, Preston School of Industry	July 8, 1918	2	2	100.0	2	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
143. Physician, Preston School of Industry	Mar. 15, 1919	2	5	100.0	4	100.0	80.0	80.0	80.0	80.0	1	20.0	20.0
144. Porter, Printing Department.	Oct. 12, 1918	5	6	100.0	5	100.0	83.3	83.3	83.3	83.3	1	16.7	16.7
145. Pressman, cylinder	Oct. 12, 1918	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
146. Pressman, platen	Oct. 12, 1918	4	3	100.0	1	100.0	35.0	35.0	35.0	35.0	3	75.0	75.0
147. Principal, Preston School of Industry.	July 8, 1918	4	3	100.0	1	100.0	35.0	35.0	35.0	35.0	3	75.0	75.0
148. Printer, floor	Oct. 12, 1918	12	10	83.3	9	83.3	40.0	40.0	40.0	40.0	1	10.0	10.0
149. Proofreader	Oct. 12, 1918	2	4	83.3	3	83.3	100.0	100.0	100.0	100.0	1	50.0	50.0
150. Psychologist, Sonoma State Home.	Oct. 12, 1918	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
151. Relief officer, Preston School of Industry.	July 8, 1918	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
152. Relief officer, Preston School of Industry.	Mar. 15, 1919	2	2	100.0	2	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
153. Relief officer, Preston School of Industry.	June 1, 1919	4	3	100.0	1	100.0	33.3	33.3	33.3	33.3	2	66.7	66.7
154. Secretary, assistant, Commission of Horticulture.	Mar. 22, 1919	3	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
155. Section hand	Jan. 1, 1919	1	1	100.0	1	100.0	100.0	100.0	100.0	100.0	1	50.0	50.0
156. Section hand	April 1, 1919	1	13	84.6	11	84.6	36.3	36.3	36.3	36.3	7	63.7	63.7
157. Special agent, Industrial Welfare Commission.	Sept. 28, 1919	3	3	100.0	3	100.0	100.0	100.0	100.0	100.0	25	65.8	65.8
158. Statistician, morbidity, State Board of Health.	Mar. 29, 1919	3	3	100.0	3	100.0	100.0	100.0	100.0	100.0	25	65.8	65.8
159. Stenographer and typist.	Aug. 3, 1918	40	38	95.0	38	95.0	34.2	34.2	34.2	34.2	25	65.8	65.8

TABLE No. 2—Concluded.
 Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1918, to July 1, 1919.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women	Number passed		Total per cent passed, men and women	Number failed		Per cent failed	Total per cent failed, men and women	
		Men	Women	Men	Women		Men	Women		Men	Women		Men	Women
160. Stenographer and typist.	Oct. 5, 1918	2	55	2	51	92.9	100.0	17.5	20.7	1	42	50.0	82.4	70.3
161. Stenographer and typist.	Dec. 7, 1918	3	50	2	27	92.4	50.0	40.4	41.7	2	28	59.6	58.3	58.3
162. Stenographer and typist.	Feb. 1, 1919	2	71	2	64	90.4	14	21.8	21.2	2	50	100.0	78.2	78.8
163. Stenographer and typist.	April 5, 1919	6	108	4	105	95.6	25.0	22.9	22.9	3	81	75.0	77.1	77.1
164. Stenographer and typist.	June 7, 1919	1	91		81	88.0	7	8.6	8.6		74		91.4	91.4
165. Stenographer and typist, State Water Commission	Jan. 9, 1919	1	1		1	100.0	100.0	100.0	100.0					
166. Supervisor, Sonoma State Home.	April 12, 1919	1		1	1	100.0	100.0	100.0	100.0					
167. Swiftelman	Oct. 5, 1918	9		8		88.8	75.0		75.0	2		25.0		25.0
168. Swiftelman	Jan. 1, 1919	7		7		100.0	57.1		57.1	3		42.9		42.9
169. Swiftelman	April 1, 1919	20		11		55.0	81.8		81.8	2		18.2		18.2
170. Teacher of arts and crafts, Sonoma State Home.	July 10, 1918	3		3		100.0								
171. Teacher of Arts and Crafts, Sonoma State Home.	May 3, 1919	2		2		100.0	100.0	50.0	50.0				63.7	63.7
172. Teacher, grade, California School for Girls.	May 3, 1919	1		1		100.0	100.0	100.0	100.0				50.0	50.0
173. Teacher, grade, Preston School of Industry.	July 8, 1918	1		1		100.0	100.0	71.4	62.5	1		100.0	28.6	37.5
174. Teacher, grade, Sonoma State Home.	July 10, 1918	2		2		100.0	100.0	100.0	100.0					
175. Teacher, grade, Sonoma State Home.	May 3, 1919	1		1		100.0	100.0	100.0	100.0					
176. Teacher of household arts, Sonoma State Home.	July 10, 1918	2		2		100.0	100.0	100.0	100.0					
177. Teacher of kindergarten and sense training, Sonoma State Home.	July 10, 1918		2		2	100.0								
178. Teacher of orchestra and band, Sonoma State Home.	July 10, 1918		2		1	50.0			100.0					
179. Teacher of recreation and gymnastics, Sonoma State Home.	July 10, 1918	3		2		66.7			100.0	2		100.0		100.0
180. Teacher of recreation and gymnastics, Sonoma State Home.	July 10, 1918		1		1	100.0					1		100.0	100.0
181. Teacher of sloyd, Sonoma State Home.	May 3, 1919		1		1	100.0			100.0					
182. Teacher of vocal and instrumental music, Sonoma State Home.	July 10, 1918		1		1	100.0			100.0					
183. Technician in Bacteriological Laboratory, Bureau of Communicable Diseases, State Board of Health.	July 10, 1918		2		2	100.0			50.0		1		50.0	50.0
184. Telephone operator	Aug. 3, 1918	1		1		100.0	100.0		100.0					
185. Telephone operator	Sept. 14, 1918	19		15		78.9	46.7		46.7	8		8	53.3	53.3
186. Telephone operator	April 26, 1919	17		15		88.2	33.3		33.3	10		10	66.7	66.7
187. Walter	Mar. 1, 1919	1		1		100.0				1		100.0		100.0

[illegible]

TABLE No. 3—Continued.
 Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1919, to July 1, 1920.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women		Number passed		Per cent passed, men and women		Number failed		Per cent failed		Total per cent failed, men and women	
		Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
80. Director of immigrant education, Immigration and Housing Commission.	Feb. 15, 1920	4	3	2	2	57.1	1	100.0	50.0	75.0	1	1	50.0	50.0	50.0	25.0	25.0
81. Director of publicity, Immigration and Housing Commission.	May 15, 1920	4	4	4	4	100.0	2	50.0	50.0	50.0	2	2	50.0	50.0	50.0	50.0	50.0
82. Director of teacher training, Immigration and Housing Commission.	May 15, 1920	2	4	2	4	100.0	4	100.0	100.0	68.7	2	2	100.0	100.0	100.0	33.3	33.3
83. Draftsman, engineering, junior.	April 17, 1920	11	9	9	9	81.8	7	77.7	77.7	77.7	2	2	100.0	100.0	100.0	22.3	22.3
84. Draftsman, engineering, II.	April 17, 1920	40	1	43	1	88.0	34	79.1	100.0	79.5	9	7	20.9	20.9	20.5	20.5	20.5
85. Draftsman, engineering, III.	April 10, 1920	33	33	33	33	100.0	28	78.7	78.7	78.7	7	7	21.3	21.3	21.3	21.3	21.3
86. Electrical foreman	July 1, 1919	7	6	6	6	85.7	5	83.3	83.3	83.3	1	1	16.7	16.7	16.7	16.7	16.7
87. Electrical foreman	April 1, 1920	2	1	1	1	50.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0	100.0	100.0
88. Electrician's helper	April 1, 1920	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0	100.0	100.0
89. Electrician, institutional	July 1, 1919	2	2	2	2	100.0	2	100.0	100.0	100.0	2	2	100.0	100.0	100.0	100.0	100.0
90. Electrician, institutional	Feb. 1, 1920	2	2	2	2	100.0	2	100.0	100.0	100.0	2	2	100.0	100.0	100.0	100.0	100.0
91. Electrician, Assistant State	April 7, 1920	12	12	12	12	100.0	3	25.0	25.0	25.0	9	9	75.0	75.0	75.0	75.0	75.0
92. Engineer, Assistant State	Feb. 7, 1920	12	12	12	12	100.0	3	25.0	25.0	25.0	9	9	75.0	75.0	75.0	75.0	75.0
93. Engineer, civil, II.	Mar. 15, 1920	78	34	37	34	48.3	34	91.8	91.8	91.8	3	3	8.2	8.2	8.2	8.2	8.2
94. Engineer, civil, II.	April 10, 1920	59	39	39	39	100.0	39	66.1	66.1	66.1	20	20	33.9	33.9	33.9	33.9	33.9
95. Engineer, civil, III (promotional).	April 10, 1920	59	39	39	39	100.0	39	66.1	66.1	66.1	20	20	33.9	33.9	33.9	33.9	33.9
96. Engineer, civil, III (promotional), State Water Commission.	Feb. 25, 1920	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0	100.0	100.0
97. Engineer, civil III.	April 10, 1920	74	68	68	68	91.8	50	73.5	73.5	73.5	18	18	26.5	26.5	26.5	26.5	26.5
98. Engineer, locomotive (promotional).	Oct. 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0	100.0	100.0
99. Engineer, locomotive	April 1, 1920	4	4	4	4	100.0	2	50.0	50.0	50.0	2	2	50.0	50.0	50.0	50.0	50.0
100. Engineer, mechanical and electrical, California School for Girls.	Aug. 1, 1919	3	2	2	2	66.7	2	100.0	100.0	100.0	2	2	100.0	100.0	100.0	100.0	100.0
101. Engineer, petroleum, Department of Oil and Gas, State Mining Bureau.	Sept. 27, 1919	10	10	10	10	100.0	9	90.0	90.0	90.0	1	1	10.0	10.0	10.0	10.0	10.0
102. Engineer testing, Purchasing Department.	Dec. 25, 1919	7	7	7	7	100.0	3	41.8	41.8	41.8	4	4	58.2	58.2	58.2	58.2	58.2
103. Engineering assistant, junior.	April 10, 1920	58	55	55	55	94.8	55	100.0	100.0	100.0	3	3	5.2	5.2	5.2	5.2	5.2
104. Executive officer, assistant, Immigration and Housing Commission.	Feb. 16, 1920	6	1	5	1	85.7	3	60.0	60.0	60.0	2	2	40.0	40.0	40.0	40.0	40.0
105. Farmhand	Aug. 1, 1919	5	5	4	4	80.0	4	100.0	100.0	100.0	1	1	20.0	20.0	20.0	20.0	20.0
106. Farmhand	Mar. 1, 1920	13	11	11	11	84.6	11	100.0	100.0	100.0	2	2	15.4	15.4	15.4	15.4	15.4
107. Farm tractor operator	Aug. 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0	100.0	100.0
108. Farm tractor operator.	Nov. 1, 1919	3	3	3	3	100.0	3	100.0	100.0	100.0	3	3	100.0	100.0	100.0	100.0	100.0

	Feb. 7, 1920	37	8	31	3	100.0	26	1	33.3	33.3	5	2	18.2	66.7	63.7
109. Field worker, Bureau of Tuberculosis, State Board of Health	April 10, 1920	3	3	3	3	83.8	2	38.8	33.3	33.3	1	1	18.2	66.7	63.7
110. Fire ranger, district, State Board of Forestry	Aug. 1, 1919	3	3	3	3	100.0	1	33.3	33.3	33.3	2	1	66.7	66.7	63.7
111. Fireman, locomotive	Oct. 1, 1919	3	3	3	3	100.0	4	100.0	100.0	100.0	1	1	100.0	100.0	100.0
112. Fireman, locomotive	April -- 1920	4	4	4	4	100.0	4	100.0	100.0	100.0	1	1	100.0	100.0	100.0
113. Fireman, locomotive	May 29, 1920	9	9	6	6	63.7	4	63.7	66.7	66.7	2	2	33.3	33.3	33.3
114. Foreman of electrical equipment, State Department of Engineering	May 29, 1920	2	2	2	2	100.0	1	50.0	50.0	50.0	1	1	50.0	50.0	50.0
115. Foreman of mechanical equipment, State Department of Engineering	Nov. 1, 1919	7	7	6	6	83.7	6	100.0	100.0	100.0	1	1	100.0	100.0	100.0
116. Gardener, landscape, assistant	Oct. 1, 1919	2	2	2	2	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
117. Gardener, landscape, head	Oct. 1, 1919	2	2	2	2	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
118. Gardener, vegetable, assistant	Aug. 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
119. Gardener, vegetable, assistant	Nov. 1, 1919	2	2	2	2	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
120. Gardener, vegetable, head	Nov. 1, 1919	2	2	2	2	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
121. Gardener, vegetable, head	Nov. 1, 1919	2	2	2	2	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
122. Hod carrier	April -- 1920	4	4	4	4	100.0	4	100.0	100.0	100.0	1	1	100.0	100.0	100.0
123. Hollerith key punch operator, Industrial Accident Commission	Oct. 15, 1919	2	2	2	2	100.0	2	100.0	50.0	50.0	1	1	50.0	50.0	50.0
124. Hydrotherapist	April 1, 1920	3	3	3	3	62.5	1	63.7	100.0	80.0	1	1	33.3	33.3	20.0
125. Inspector, boiler, Industrial Accident Commission	June 25, 1920	5	5	4	4	80.0	1	25.0	25.0	25.0	3	3	75.0	75.0	75.0
126. Inspector, camp, Immigration and Housing Commission	Feb. 16, 1920	20	1	20	1	100.0	12	60.0	57.1	57.1	8	1	40.0	100.0	42.9
127. Inspector, elevator	June 26, 1920	7	7	6	6	85.7	3	50.0	50.0	50.0	3	3	50.0	50.0	50.0
128. Inspector, housing, Immigration and Housing Commission	Oct. 7, 1919	13	4	9	3	70.5	1	11.1	63.7	25.0	8	1	88.9	33.3	75.0
129. Inspector, insurance, Compensation Insurance Fund	Oct. 15, 1919	5	5	4	4	80.0	4	100.0	100.0	100.0	1	1	100.0	100.0	100.0
130. Inspector, insurance, chief, Compensation Insurance Fund	Oct. 15, 1919	2	2	2	2	100.0	1	50.0	50.0	50.0	1	1	50.0	50.0	50.0
131. Inspector, motor vehicle	July 19, 1919	44	44	41	41	93.1	11	26.8	26.8	26.8	30	30	73.2	73.2	73.2
132. Inspector, petroleum, Oil and Gas Department, State Mining Bureau	Feb. 28, 1920	4	4	4	4	100.0	4	100.0	100.0	100.0	1	1	100.0	100.0	100.0
133. Interpreter, Immigration and Housing Commission	Feb. 16, 1920	2	3	2	2	100.0	1	50.0	50.0	50.0	1	3	50.0	100.0	80.0
134. Investigator, special, rehabilitation work, Immigration and Housing Commission	Oct. 15, 1919	5	5	5	5	100.0	4	80.0	80.0	80.0	1	1	20.0	20.0	20.0
135. Janitor	Sept. 1, 1919	14	11	11	11	78.5	9	81.8	81.8	81.8	2	2	18.2	18.2	18.2
136. Janitor	April -- 1920	11	3	11	3	100.0	8	72.7	72.7	72.7	3	3	27.3	27.3	27.3
137. Landress, assistant	Aug. 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
138. Landress, assistant	Nov. 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
139. Laundryman, assistant	Aug. 1, 1919	2	2	2	2	50.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
140. Laundryman, assistant	Nov. 1, 1919	3	3	3	3	100.0	3	100.0	100.0	100.0	1	1	100.0	100.0	100.0
141. Laundryman, head	Aug. 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
142. Laundryman, head	Nov. 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
143. Laundry help	Nov. 1, 1919	16	16	15	15	93.7	15	100.0	100.0	100.0	1	1	100.0	100.0	100.0
144. Library student	July 1, 1919	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
145. Lineman	Feb. 1, 1920	1	1	1	1	100.0	1	100.0	100.0	100.0	1	1	100.0	100.0	100.0
146. Lineman	April -- 1920	3	3	3	3	100.0	3	100.0	100.0	100.0	1	1	100.0	100.0	100.0
147. Lineman	April -- 1920	8	8	8	8	100.0	8	88.8	88.8	88.8	1	1	11.2	11.2	11.2
148. Machinist	April -- 1920	9	9	9	9	100.0	9	100.0	100.0	100.0	1	1	100.0	100.0	100.0

TABLE No. 3—Continued.

Tabular Statement of Examinations Held and Results Obtained During Period From July 1, 1919, to July 1, 1920.

Kind of examination	Date	Number of applicants		Number examined		Per cent examined, men and women		Number passed		Per cent passed		Total per cent passed, men and women		Number failed		Per cent failed		Total per cent failed, men and women	
		Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
149. Machinist, Printing Office.	Aug. 1, 1919	9	7	9	6	100.0	85.7	6	6	66.7	100.0	66.7	100.0	3	3	33.3	33.3	33.3	33.3
150. Matron, California School for Girls.	Aug. 1, 1919	4	4	4	3	100.0	100.0	3	3	75.0	100.0	75.0	100.0	1	1	25.0	25.0	25.0	25.0
151. Mechanic	Aug. 2, 1919	2	3	2	1	60.0	100.0	1	1	100.0	100.0	100.0	100.0						
152. Messenger	Oct. 1, 1919	1	1	1	2	100.0	100.0	1	1	100.0	50.0	66.7	100.0		1		50.0	33.3	33.3
153. Messenger	Nov. 1, 1919	1	2	1	2	100.0	100.0	3	4	100.0	100.0	100.0	100.0						
154. Messenger	Jan. 3, 1920	3	3	3	4	100.0	100.0	2	4	66.7	100.0	85.7	100.0	1	1	33.3	14.3	14.3	14.3
155. Messenger	Feb. 7, 1920	3	4	3	1	100.0	100.0	1	2	100.0	100.0	100.0	100.0						
156. Messenger	April 3, 1920	4	2	4	2	100.0	100.0	7	1	100.0	100.0	100.0	100.0						
157. Messenger	Feb. 16, 1920	1		1		100.0		1		100.0		100.0							
158. Messenger, Immigration and Housing Commission.	Oct. 15, 1919	7		7		100.0		1		100.0		100.0							
159. Messenger, Industrial Accident Commission.	Oct. 15, 1919	1		1		100.0		1		100.0		100.0							
160. Milker	Nov. 1, 1919	3		3		100.0		3		100.0		100.0							
161. Milker	Nov. 1, 1919	3		3		100.0		3		100.0		100.0							
162. Multicolor press operator, Industrial Accident Commission	Oct. 15, 1919	1	1	1	1	100.0	100.0	1	1	100.0	100.0	100.0	100.0						
163. Nurse	Dec. 1, 1919		3		1	33.3						100.0							
164. Nurse, public health	Dec. 1, 1919		3		1	33.3						100.0							
165. Nurseryman, State Board of Forestry.	May 1, 1920	5	34	5	31	91.1	89.4	2	16	40.0	51.6	51.6	40.0	3	15	43.4	43.4	43.4	43.4
166. Painter	April 10, 1920	19	17	17	17	100.0	89.4	11	11	64.7	64.7	64.7	64.7	8	8	40.0	40.0	40.0	40.0
167. Physician, first assistant.	Oct. 11, 1919	9	1	18	1	90.0	100.0	6	1	75.0	100.0	87.5	100.0	3	0	46.3	46.3	46.3	46.3
168. Physician, second and other assistant.	Oct. 11, 1919	13	4	10	4	82.3	100.0	5	3	50.0	75.0	37.1	100.0	5	1	25.0	25.0	25.0	25.0
169. Plumber, foreman	April 1, 1920	3	3	3	3	100.0	100.0	2	2	66.7	100.0	66.7	100.0	1	1	33.3	33.3	33.3	33.3
170. Plumber	April 1, 1920	32	30	30	25	93.7	83.3	25	25	83.3	83.3	83.3	83.3	5	5	16.7	16.7	16.7	16.7
171. Plumber, foreman	April 1, 1920	3	3	3	3	100.0	100.0	3	3	100.0	100.0	100.0	100.0						
172. Plasterer	April 1, 1920	4	4	4	4	100.0	100.0	4	4	100.0	100.0	100.0	100.0						
173. Plumber, foreman	April 1, 1920	5	5	5	5	100.0	100.0	5	5	100.0	100.0	100.0	100.0						
174. Plumber	Oct. 1, 1919	23	18	18	11	78.3	61.1	11	11	61.1	61.1	61.1	61.1	7	7	30.4	30.4	30.4	30.4
175. Plumber	April 1, 1920	16	13	13	12	81.2	92.3	12	12	92.3	92.3	92.3	92.3	1	1	6.2	6.2	6.2	6.2
176. Plumber, helper	April 1, 1920	1	1	1	1	100.0	100.0	1	1	100.0	100.0	100.0	100.0						
177. Porter	April 1, 1920	1	1	1	1	100.0	100.0	1	1	100.0	100.0	100.0	100.0						
178. Porter, Printing Office	April 1, 1920	3	3	3	3	100.0	100.0	3	3	100.0	100.0	100.0	100.0						
179. Poultryman, head	Oct. 1, 1919	3	3	3	3	100.0	100.0	3	3	100.0	100.0	100.0	100.0						
180. Pressman, cylinder	Aug. 1, 1919	2	2	2	2	100.0	100.0	2	2	100.0	100.0	100.0	100.0						
181. Pressman, cylinder	April 1, 1920	3	3	3	3	100.0	100.0	3	3	100.0	100.0	100.0	100.0						
182. Proofreader	April 1, 1920	2	2	2	2	100.0	100.0	1	1	50.0	100.0	50.0	100.0	1	1	50.0	50.0	50.0	50.0
183. Proofreader, apprentice	Nov. 3, 1919		14		1	100.0						100.0							
184. Proofreader, temporary, Motor Vehicle Dept.	Nov. 3, 1919		14		1	100.0						100.0							
185. Purchasing Agent, deputy	Oct. 11, 1919	10	8	8	1	80.0		1	1	12.5	12.5	12.5	12.5	7	7	70.0	70.0	70.0	70.0

184. Referee, Industrial Accident Commission.	Oct. 15, 1919	10	8	50.0	5	62.5	62.5	82.5	3	37.5	37.5
187. Secretary, assistant, Industrial Accident Com.	Oct. 15, 1919	7	6	85.7	5	83.3	83.3	83.3	1	18.7	18.7
188. Secretary, Compensation Insurance Fund.	Oct. 15, 1919	2	2	100.0	1	50.0	50.0	50.0	1	50.0	50.0
189. Secretary, assistant, Compensation Insurance Fund.	Oct. 15, 1919	1	1	100.0	1	100.0	100.0	100.0	1	100.0	100.0
190. Section hand.	April -- 1920	1	6	100.0	6	100.0	100.0	100.0	1	100.0	100.0
191. Sheet metal worker.	April -- 1920	6	4	80.0	4	80.0	80.0	80.0	2	10.6	10.6
192. Special agent, Industrial Accident Commission.	Oct. 15, 1919	21	19	90.4	17	89.4	89.4	89.4	2	25.0	25.0
193. Special agent, Compensation Insurance Fund.	Mar. 22, 1920	4	4	100.0	3	75.0	75.0	75.0	1	5	5
194. Special agent, Industrial Welfare Commission.	Jan. 10, 1920	16	14	87.5	9	61.2	61.2	61.2	2	1	1
195. Statistician, Industrial Accident Commission.	Oct. 15, 1919	4	4	100.0	2	50.0	50.0	50.0	2	1	1
196. Statistician, assistant, Industrial Accident Com.	Oct. 15, 1919	1	1	100.0	1	100.0	100.0	100.0	4	4	4
197. Statistician, State Controller (promotional).	Sept. 1, 1919	1	1	100.0	1	100.0	100.0	100.0	1	100.0	100.0
198. Statistician, deputy State Board of Health.	Oct. 15, 1919	2	2	83.3	3	100.0	100.0	100.0	1	33.3	33.3
199. Statistician, State Board of Health.	Sept. 23, 1920	3	3	100.0	3	100.0	100.0	100.0	1	100.0	100.0
200. Statistician, Department of Public Instruction.	Dec. 27, 1919	2	11	91.5	8	72.7	72.7	72.7	3	27.3	27.3
201. Steamfitter, foreman.	April -- 1920	12	11	100.0	1	100.0	100.0	100.0	1	100.0	100.0
202. Steamfitter, helper.	April -- 1920	1	2	34	13	38.2	38.2	38.2	2	21	21
203. Stenographer and typist.	Aug. 2, 1919	2	2	63	32	50.8	50.8	50.8	31	49.2	49.2
204. Stenographer and typist.	Oct. 4, 1919	5	1	51	14	100.0	100.0	100.0	37	72.6	72.6
205. Stenographer and typist.	Dec. 6, 1919	1	1	52	18	34.6	34.6	34.6	1	84	84
206. Stenographer and typist.	Feb. 7, 1920	1	1	58	35	60.3	60.3	60.3	23	39.7	39.7
207. Stenographer and typist.	April 3, 1920	65	38	54.8	1	22	100.0	100.0	14	39.9	39.9
208. Stenographer and typist.	June 5, 1920	1	1	100.0	1	100.0	100.0	100.0	1	100.0	100.0
209. Stenographer and typist (promotional).	June 21, 1920	1	7	100.0	7	100.0	100.0	100.0	1	100.0	100.0
210. Stenographer and typist, Compensation Insurance Fund.	Mar. 22, 1920	2	2	50.0	1	100.0	100.0	100.0	1	100.0	100.0
211. Stenographer and typist, State Fish Exchange.	Feb. 21, 1920	2	1	50.0	1	100.0	100.0	100.0	1	100.0	100.0
212. Stenographer and typist, Immigration and Housing Commission.	Feb. 16, 1920	6	5	83.3	5	100.0	100.0	100.0	1	100.0	100.0
213. Stenographer and typist, Industrial Accident Com.	Oct. 15, 1919	17	15	88.2	15	100.0	100.0	100.0	1	100.0	100.0
214. Superintendent of underwriting, Compensation Insurance Fund.	Oct. 15, 1919	1	1	100.0	1	100.0	100.0	100.0	1	100.0	100.0
215. Supervisor, assistant, Agnews State Hospital.	Nov. 15, 1919	3	3	83.3	2	68.7	68.7	68.7	1	33.3	33.3
216. Supervisor in physical education, assistant.	Nov. 29, 1919	7	7	83.3	2	28.5	28.5	28.5	5	71.5	71.5
217. Supervisor in physical education, (medical) assistant.	May 15, 1920	1	1	100.0	1	100.0	100.0	100.0	2	50.0	50.0
218. Supervisor of trade and industrial instruction.	Aug. 1, 1919	4	4	100.0	2	50.0	50.0	50.0	2	50.0	50.0
219. Switchman.	July 1, 1919	2	2	25.5	2	100.0	100.0	100.0	1	33.3	33.3
220. Switchman.	Oct. 1, 1919	3	3	100.0	2	68.7	68.7	68.7	1	16.7	16.7
221. Switchman.	April -- 1920	9	6	68.7	5	83.3	83.3	83.3	1	100.0	100.0
222. Tax expert, franchise (promotional).	Sept. 19, 1919	1	1	100.0	1	100.0	100.0	100.0	1	100.0	100.0
223. Tax expert, redemption (promotional).	Sept. 1, 1919	1	1	100.0	3	60.0	60.0	60.0	1	40.0	40.0
224. Tax expert, redemption.	Sept. 14, 1920	6	2	87.5	1	100.0	100.0	100.0	4	36.4	36.4
225. Teamster.	April -- 1920	1	1	100.0	1	100.0	100.0	100.0	8	27.7	27.7
226. Telephone operator.	Feb. 28, 1920	12	34	91.7	23	72.3	72.3	72.3	1	100.0	100.0
227. Truckdriver.	April -- 1920	40	20	85.0	20	100.0	100.0	100.0	5	100.0	100.0
228. Typist, Immigration and Housing Commission.	Oct. 15, 1919	5	5	100.0	5	100.0	100.0	100.0	1	100.0	100.0
229. Typist, Compensation Insurance Fund.	Mar. 22, 1920	5	5	100.0	5	100.0	100.0	100.0	1	100.0	100.0

LIST OF PERSONS WHO ASSISTED IN CONDUCTING EXAMINATIONS DURING THE BIENNIAL PERIOD 1918 - 1920.

Name	Business or Profession.	Examination.
Abbott, F. H.	President Hicks-Judd Company, San Francisco.	Cost checker, State Printing Office.
Allen, S. W.	United States Forest Service, Los Angeles.	District fire ranger.
Armstrong, J. S.	Nurseryman, Ontario, California.	Nurseryman.
Arnold, Horace.	Automobile dealer, Sacramento.	Inspector, Motor Vehicle Department.
Arnoviel, Carol.	Director of housing, Commission of Immigration and Housing.	Housing inspector.
Avery, L. B.	Assistant Superintendent of Schools, Oakland.	Immigration and Housing Commission positions.
Barnes, M. P.	Automobile Association, Sacramento.	Inspector, Motor Vehicle Department.
Beach, Dr. E. C.	Superintendent of Physical Education, elementary and intermediate schools, Los Angeles.	Assistant supervisor of physical education.
Bedford, T. A.	Division Engineer, California Highway Commission, Dunsmuir.	Engineering draftsman II, civil engineer, junior engineering assistant.
Bell, J. T.	Examiner, Southern Pacific Company.	Railroad clerk, locomotive engineer (promotional).
Bendel, E. H.	Engineer, San Luis Obispo.	Engineering draftsman II, civil engineer II, junior engineering assistant.
Benedict, W. A.	United States Forest Service, Fresno.	District fire ranger.
Bertzhoff, A. F.	Union Lithograph Company, San Francisco.	Assistant foreman of bindery, assistant foreman proofroom.
Bogardus, Prof. E. S.	Professor of Sociology, University of Southern California.	Director of community organization, director of teacher-training, Immigration and Housing Commission positions.
Bolt, Dr. R. A.	Director Alameda County Public Health Center, Oakland.	Director Bureau of Child Hygiene.
Bowman, J. W.	Foreman of Composing Room, State Printing Office, Sacramento.	Printing office positions.
Brereton, C. V.	United States Forest Service, San Francisco.	District fire ranger.
Brown, H. J.	Marchant Calculating Machine Company, Oakland.	Examiner State Corporation Department.
Brown, P. W.	Examiner, Los Angeles County Civil Service Commission.	Auditor, bookkeeper, public health nurse, chief clerk, stenographer.
Brownell, J. R.	Superintendent of Safety, Industrial Accident Commission, San Francisco.	Boiler inspector, mechanical engineer, Department of Safety, Industrial Accident Commission.
Bryan, Edith S.	Assistant Professor of Public Health Nursing, University of California.	Public health nurse.
Burch, W. B.	Engineer, San Luis Obispo.	Engineering draftsman II, civil engineer II, junior engineering assistant.
Burgess, C. W.	Capitalist, Waldo Point, California.	Carpenter.
Bush, R. D.	Deputy Oil and Gas Supervisor, State Mining Bureau, San Francisco.	Petroleum engineer.
Butler, Dr. F. O.	Medical Superintendent, Sonoma State Home, Eldridge.	Attendant, Sonoma State Home.
Calder, Dr. D. H.	Chief Psychiatrist, Los Angeles County Hospital, and temporarily Medical Director.	Preston School positions, assistant physician.
Chandler, A. E.	Consulting Engineer, Berkeley.	Engineer III State Water Commission.
Chenoweth, S. C.	County Superintendent of Schools, Ekersfield.	Petroleum engineer.
Chestnutwood, W. H.	Business Manager, Stockton State Hospital.	Quartermaster commissary, Veterans Home, teacher Sonoma State Home.

LIST OF PERSONS WHO ASSISTED IN CONDUCTING EXAMINATIONS DURING THE BIENNIAL PERIOD 1918 - 1920—Continued.

Name	Business or Profession.	Examination.
Childs, Judge J. L.	Judge Superior Court, Crescent City.	Civil engineer II, engineering draftsman II, junior engineering assistant.
Christlerson, S. V.	Standardization Inspector, State Department of Agriculture, Sacramento.	Apple inspector.
Clark, Dr. F. L.	Medical Superintendent, Stockton State Hospital.	Attendant, Stockton State Hospital.
Clark, W. G.	News Publishing Company, Sacramento.	Cost checker, State Printing Office.
Clark, W. L.	Division Engineer, California Highway Commission, San Francisco.	Civil engineer III (promotional), construction engineer, engineering draftsman III.
Clarke, E. P.	President, State Board of Education, Los Angeles.	Credentialed clerk, assistant secretary in charge of credentials.
Conslins, Capt. H. H.	Eureka.	Bridge tender.
Crandall, E. E.	Schwabacher-Frey Company, San Francisco.	Cost checker, State Printing Office.
Curtis, S. W.	Assistant State Engineer, Sacramento.	Senior engineering draftsman, junior engineering draftsman, engineering assistant, civil engineer II.
Davis, B. A.	Examiner, Los Angeles County Civil Service Commission.	Auditor, public health nurse.
DeBell, W. H.	Deputy Superintendent of Schools, San Francisco.	Stenographer, teacher, Sonoma State Home.
De Groot, E. B.	Scout Executive, Boy Scouts of America, Los Angeles.	Assistant supervisor in physical education.
de Saules, C.	Superintendent of Accounts, State Board of Control, Sacramento.	Bookkeeper, auditor.
Dodge, R. E.	Office Engineer, California Highway Commission, San Francisco.	Delineator (senior and junior).
Donnelly, Dr. F. E.	Assistant Physician, Napa State Hospital.	Hydrotherapist.
Donohoe, R. E.	Engineer, Whittits.	Engineering draftsman II, civil engineer II, junior engineering assistant.
Doty, F. E.	Secretary and Chief Examiner, Los Angeles County Civil Service Commission, Los Angeles.	Assistant secretary in charge of credentials, elevator inspector, auditor, bookkeeper, telephone operator.
Dulfer, Alex.	Alex Dulfer Printing Company, San Francisco.	Assistant foreman of bindery, assistant foreman of proof room.
Dutton, J. W.	Superintendent of Construction, State Department of Engineering, Sacramento.	Carpenter.
Etcheverry, Prof. B. A.	Professor of Irrigation Engineering, University of California.	Assistant State Engineer.
Ewing, A. D.	United States Forest Service, Fresno.	District fire ranger.
Farles, D. T.	Auto Club of Southern California, Los Angeles.	Inspector, Motor Vehicle Department.
Farville, W. B.	Architect, San Francisco.	Deputy State Architect.
Fessenden, H. E.	Otis Elevator Company, San Francisco.	Elevator inspector.
Fickelsen, A. G.	Chief Deputy, State Corporation Department, San Francisco.	Engineer State Corporation Department, examiner State Corporation Department, deputy State Corporation Department.
Foote, F. S. Jr.	Professor of Railroad Engineering, University of California.	Civil engineer II, engineering draftsman II, junior engineering assistant.

Force, Dr. J. N.	Assistant Professor of Epidemiology, University of California	Director Bureau of Child Hygiene.
Galloway, J. D.	Consulting Engineer, San Francisco	Engineer III, State Water Commission, Assistant State Engineer.
Geraldson, Dr. L. A.	Assistant Physician, Napa State Hospital	Hydrotherapist.
Gibson, L. H.	Division Engineer, California Highway Commission, San Luis Obispo	Civil engineer II, junior engineering assistant, engineering draftsman II.
Gillette, P. S.	Southern Pacific Company	Plumber.
Gimlore, A.	Southern Pacific Company	Belt Railroad positions.
Glasco, E. I.	United States Forest Service, Redding	District fire ranger.
Golden, W. P.	Chief Examiner, Southern Pacific Company, San Francisco	Chief clerk.
Gough, W. P.	Assistant highway engineer, California Highway Commission, Sacramento	Autotruck driver and chauffeur.
Gray, Capt. W. J. Jr.	Tugboat Securities Company, San Francisco	Tugboat captain.
Grunsky, C. E.	Consulting engineer, San Francisco	Civil engineer III (promotional), construction engineer, engineering draftsman III.
Hagelthorn, Signe	Supervisor of Physical Education, San Francisco School Department	Assistant supervisor in physical education.
Harvey, Dr. R. W.	Instructor in Neurology, University of California	Public health nurse.
Haselwood, F. W.	Assistant Division Engineer, California Highway Commission, Willits	Engineering draftsman II, civil engineer II, junior engineering assistant.
Hawley, J. B.	Mechanical engineer, State Department of Engineering, Sacramento	Mechanical engineering draftsman, grades I and II, plumber.
Hays, W. C.	Architect, San Francisco	Deputy State Architect.
Hecke, G. H.	Director, State Department of Agriculture, Sacramento	Field deputy Commission of Horticulture.
Heinrich, O. H.	City Manager, Boulder, Colorado	Assistant to the Superintendent Bureau of Criminal Identification and Investigation.
Hemingway, R. L.	Boiler engineer, Industrial Accident Commission, San Francisco	Boiler inspector.
Henderson, H. P.	General Manager, Western Wheel Scraper Company, San Francisco	Chief clerk.
Hermann, F. C.	Consulting engineer, San Francisco	Assistant State Engineer, engineer III, State Water Commission.
Heron, A. R.	Assistant Superintendent of Accounts, State Board of Control, Sacramento	Bookkeeper.
Hetherington, C. W.	Supervisor of Physical Education, State Board of Education, Sacramento	Assistant supervisor in physical education.
Hixson, M. C.	General Electric Company, San Francisco	General foreman of electrical equipment.
Hockenberry, Miss Orpha	Hydrotherapist, Napa State Hospital	Hydrotherapist.
Hoisholt, Dr. A. W.	Medical Superintendent, Napa State Hospital	Attendant, Napa State Hospital.
Holderman, Col. N. M.	Commandant, Veterans' Home of California	Attendant, Veterans' Home.
Hopkins, J. E.	Foreman of Janitors, Board of State Harbor Commissioners, San Francisco	Watchman.
Howard, Dr. B. F.	Physician, Sacramento	Assistant supervisor in physical education (medical).
Hudson, R.	Architect, San Francisco	Deputy State Architect.

LIST OF PERSONS WHO ASSISTED IN CONDUCTING EXAMINATIONS DURING THE BIENNIAL PERIOD 1918 - 1920—Continued.

Name	Business or Profession.	Examination.
Hughes, E. J.	Attorney, Sacramento	Redemption tax expert, franchise tax expert, statistician, State Controller's office.
Hunt, A. M.	Consulting engineer, San Francisco	Engineer III State Water Commission, Assistant State Engineer.
Hunter, W. G.	Assistant highway engineer, California Highway Commission, Sacramento	Civil engineer II, engineering draftsman II, junior engineering assistant.
Jacobsen, W. C.	Superintendent for Rodent Control, State Department of Agriculture, Sacramento	Nurseryman, field assistant for rodent control.
Johnson, E. W.	Federal Agent Industrial Education, Federal Board of Vocational Education, San Francisco	Supervisor of trade and Industrial instruction.
Johnson, Dr. Julia	Los Angeles City Nursing Committee	Public health nurse.
Jones, R. L.	Engineer, Sutter Basin Company, Sacramento	Civil engineer III (promotional), construction engineer, engineering draftsman III.
Jones, S. L.	Northern Commercial Company, San Francisco	Deputy purchasing agent.
Joyner, F. H.	Engineer, Los Angeles County Highway Commission, Los Angeles	Civil engineer III (promotional), construction engineer, engineering draftsman III, civil engineer II, junior engineering assistant, engineering draftsman II.
Juel, A.	San Francisco Police Department	Identification expert, handwriting expert, finger print clerk, assistant to the Superintendent Bureau of Criminal Identification and Investigation.
Kaupke, C. L.	Engineer, Fresno	Engineering draftsman II, civil engineer II, junior engineering assistant.
Kellogg, Dr. W. H.	Director, Bureau of Communicable Diseases, State Board of Health, Berkeley	Field worker Bureau of Tuberculosis, public health nurse, Director Bureau of Child Hygiene.
Kelly, Dr. F. L.	Epidemiologist, State Board of Health, Berkeley.	Technician bacteriological laboratory.
Keogh, A.	Port Captain for Sudden and Christenson, San Francisco	State wharfinger.
Kern, Dr. W. B.	Medical Superintendent, Norwalk State Hospital	Attendant, Norwalk State Hospital, assistant physician.
Kromer, C. H.	Chief Structural Engineer, State Department of Engineering, Sacramento	Structural draftsman.
Lack, M. D.	Secretary, State Board of Equalization, Sacramento	Statistician, State Controller's office.
Lancaster, P. L.	Engineer, Willits	Engineering draftsman II, civil engineer II, junior engineering assistant.
Langeller, W. F.	Assistant Professor of Sanitary Engineering, University of California	Housing inspector.
La Porte, W. R.	Professor of Physical Education and Director of Men's Gymnasium, University of Southern California	Assistant supervisor in physical education.
Leatham, C.	Otis Elevator Company, San Francisco	Elevator inspector.
Lee, C. D.	Berkeley Police Department	Identification expert, handwriting expert, finger print clerk.
Leland, C. G.	Draftsman, California Highway Commission, Dunsmuir	Engineering draftsman II, civil engineer II, junior engineering assistant.
Lennon, Dr. M. B.	Assistant Clinical Professor of Neurology, University of California	Assistant physician.

Leonard, Prof. R. J.	Professor of Vocational Education, University of California	Supervisor of trade and industrial instruction.
Leurey, L. F.	Electrical Engineer, San Francisco	General foreman of electrical equipment.
Lewis, G. L.	Engineer, Crescent City	Civil engineer II, engineering draftsman II, junior engineering assistant.
Lucas, Dr. W. P.	Professor of Pediatrics, University of California	Director Bureau of Child Hygiene.
Luppen, L. B.	Chief Engineer, Bureau of Architecture, State Department of Engineering, Sacramento	General foreman of mechanical equipment, California School for Girls positions.
McCallum, J. H.	President, Board of State Harbor Commissioners, San Francisco	State wharfinger.
McDuffie, Mrs. Jean	Prominent civic and welfare worker, Berkeley	Director Bureau of Child Hygiene.
Mackie, H. E.	General Superintendent, Bureau of Architecture, State Department of Engineering, Sacramento	Elevator inspector.
McLaughlin, R. P.	State Oil and Gas Supervisor, State Mining Bureau, San Francisco	Petroleum engineer.
Mainland, J.	Accountant, Haskins and Sells Company, Los Angeles	Auditor.
Mallory, L. B.	Assistant Deputy Commissioner, Bureau of Labor Statistics, Fresno	District fire ranger.
Markwart, A. H.	Consulting engineer, San Francisco	Supervisor of trade and industrial instruction.
Maskew, F.	Collaborator, State Department of Agriculture, Sacramento	Quarantine inspector.
Matuskiewicz, M.	Secretary Sacramento Typothetae	Cost checker, State Printing Office.
Meilin, G. F.	Engineer, State Reclamation Board, Sacramento	Senior engineering draftsman, junior engineering draftsman, engineering assistant, civil engineer II.
Merrill, G. A.	Principal, California School of Mechanical Arts, San Francisco	Supervisor of trade and industrial instruction.
Miller, G. I.	United States Forest Service, Willits	District fire ranger.
Miller, R. J.	Executive Officer, Commission of Immigration and Housing, San Francisco	Housing inspector.
Miller, W. C.	Assistant Resident Engineer, California Highway Commission, Fresno	Engineering draftsman II.
Mitchell, W. K.	Examiner, Los Angeles County Civil Service Commission	Auditor, bookkeeper, telephone operator.
Montgomery, J. S.	Superintendent, Preston School of Industry	Teacher, Sonoma State Home.
Morrill, C. F.	Superintendent, Bureau of Criminal Identification and Investigation, Sacramento	Identification expert, handwriting expert, finger print clerk.
Morrison, A. R.	Office Engineer, California Highway Commission, Fresno	Engineering draftsman II.
Morse, B. M.	H. S. Crocker Company, San Francisco	Assistant foreman of bindery, assistant foreman of proof room.
Murray, C.	Engineer, Fresno	Engineering draftsman II, civil engineer II, junior engineering assistant.
Murray, J. C.	Deputy, State Corporation Department	Deputy Corporation Department.
Norton, C. K.	Executive Secretary, Commission of Immigration and Housing, San Francisco	Housing inspector.
Null, G. W.	Draftsman, California Highway Commission, Sacramento	Senior engineering draftsman, junior engineering draftsman, engineering assistant, civil engineer II.
O'Callaghan, J. S.	President, State Board of Pharmacy, San Francisco	Druggist.

LIST OF PERSONS WHO ASSISTED IN CONDUCTING EXAMINATIONS DURING THE BIENNIAL PERIOD 1918 - 1920—Continued.

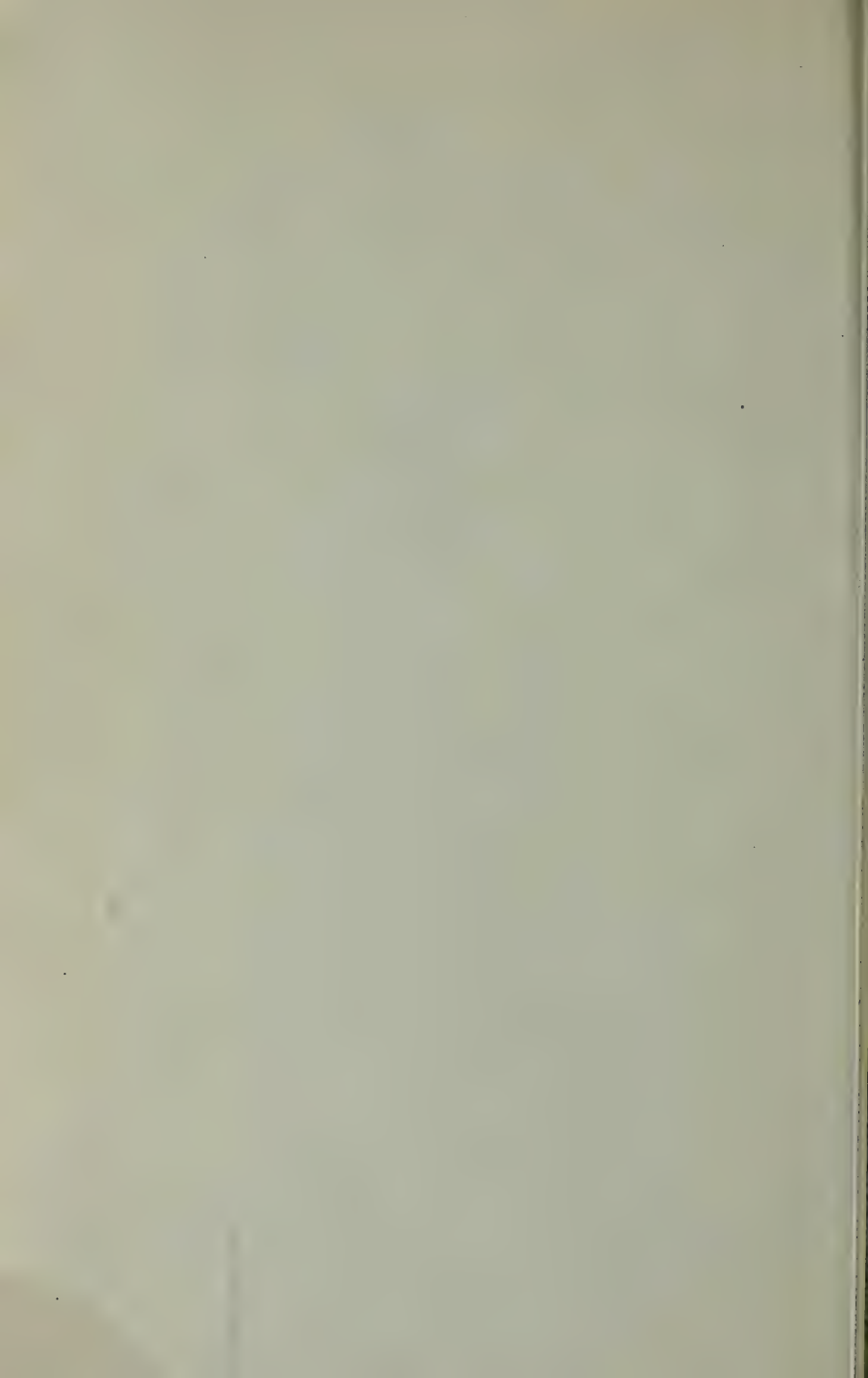
Name	Business or Profession.	Examination.
Osgood, T. W.	Assistant Superintendent of Safety, Industrial Accident Commission, Los Angeles.	Elevator Inspector.
Page, F. A.	Boiler Inspector, Industrial Accident Commission, San Francisco.	Boilermaker.
Patch, W. W.	Division Engineer, California Highway Commission, Los Angeles.	Civil engineer III (promotional), construction engineer, engineering draftsman III, civil engineer II, engineering draftsman II, junior engineering assistant.
Piper, S. E.	Assistant Biologist, United States Department of Agriculture.	Field Assistant for rodent control.
Pothury, A. E.	El Dorado Oil Company, Berkeley.	General foreman of mechanical equipment.
Pratt, M. B.	Deputy State Forester, Sacramento.	District fire ranger.
Probert, Prof. F. H.	Dean of the College of Mining, University of California.	Engineer State Corporation Department.
Randall, Capt. C.	Hind, Rolph and Company, San Francisco.	Tugboat captain.
Rappelye, Dr. W. C.	University of California Hospital.	Public health nurse.
Read, F. W.	Specialist in Standardization, State Department of Agriculture, Sacramento.	Apple inspector.
Reld, Dr. Eva C.	University of California Hospital.	Assistant physician.
Reinhardt, Dr. A.	President, Mills College, Oakland.	Public health nurse.
Rew, R. E.	Pureka.	Bridge tender.
Richards, Dr. R. L.	Medical Superintendent, Mendocino State Hospital.	Attendant, Mendocino State Hospital.
Root, C. A.	County Recorder, Sacramento.	Statistical, State Controller's office.
Ross, L. E.	State Registrar, State Board of Health, Sacramento.	Deputy statistician, State Board of Health.
Sayer, T. J.	Chief Engineer, R. A. Rowan and Company, Los Angeles.	Preston School positions.
Saph, A. V.	Consulting engineer, San Francisco.	Assistant division engineer.
Satterlee, I. C.	Building Estimator, State Department of Engineering, Sacramento.	Carpenter.
Scharrenberg, P.	Member of Commission of Immigration and Housing, San Francisco.	Positions with the Commission of Immigration and Housing.
Schlelp, W.	Assistant Superintendent of Accounts, State Board of Control, Sacramento.	Business agent, State Board of Control.
Schnalttacher, S.	Architect, San Francisco.	Deputy State Architect, housing inspector.
Shaffer, W. E.	Foreman Machinist, Belt Railroad, Board of State Harbor Commissioners, San Francisco.	Rollermaker.
Slim, Geo.	Superintendent of Playgrounds, Sacramento.	Assistant supervisor in physical education, assistant supervisor in physical education (medical).
Simonsen, G.	Electrical engineer, State Department of Engineering, Sacramento.	Electrical engineering draftsman grades I and II, general foreman of electrical equipment.
Smith, H. S.	Superintendent of Insectary and Entomologist, State Department of Agriculture, Sacramento.	Apple Inspector.
Sommer, F. G.	Division Engineer, California Highway Commission, Whittles.	District fire ranger, bridge tender, civil engineer II, engineering draftsman II, junior engineering assistant.

Stabler, W. H.	Department of Veterinary Science, University of California	Dairy inspector.
Stahl, S. S.	Assistant Division Engineer, California Highway Commission, Dunsmuir	Engineering draftsman II, civil engineer II, junior engineering assistant.
Standley, J. G.	Office Engineer, California Highway Commission, Dunsmuir	Engineering draftsman II.
Stanton, C. P.	Foreman Electrician, Board of State Harbor Commissioners, San Francisco	Electrician.
Stocking, Dr. L. J.	Medical Superintendent, Agnews State Hospital.	Attendant, Agnews State Hospital.
Stromgren, C. D.	Principal of Automobile School, Los Angeles Y. M. C. A.	Autotruck driver and chauffeur.
Stewart, F. E.	Superintendent of Belt Railroad, Board of State Harbor Commissioners, San Francisco	Railroad clerk.
Swinnerton, C. M.	Secretary of the Plumbers Examining Board, Los Angeles County	Preston School positions.
Taussig, R. J.	Regent, University of California.	Supervisor of trade and industrial instruction.
Telfer, R. L.	Superintendent of State Printing, Sacramento.	Cost checker, State Printing Office.
Thomas, H. I.	Accountant, Los Angeles	Auditor.
Thompson, A. H.	United States Forest Service, Willits	District fire ranger.
Trahn, C. A.	Elevator Inspector, Industrial Accident Commission, Los Angeles	Elevator inspector.
Vollmer, A.	Chief of Police, Berkeley	Assistant to the Superintendent Bureau of Criminal Identification and Investigation.
Vortiede W.	Head Gardener, State Capitol Grounds, Sacramento	Nurseryman, garden laborer.
Waddell, T. B.	Office engineer, State Reclamation Board, Sacramento	Junior engineering assistant, civil engineer II, engineering draftsman II, civil engineer III (promotional), construction engineer, engineering draftsman III, redemption tax expert.
Wade, A.	Boiler inspector, Industrial Accident Commission, Los Angeles	Boiler inspector.
Wagner, A. J.	Assistant Highway Engineer, California Highway Commission, Sacramento	Senior engineering draftsman, junior engineering draftsman, engineering assistant, delineator (senior and junior), civil engineer II.
Washburn, Prof. J. B.	Professor of Economics, University of California.	Inspector Building and Loan Commissioner.
Watkins, D. E.	California Automobile Association, San Francisco	Inspector Motor Vehicle Department.
Weaver, C. N.	Automobile dealer, San Francisco	Inspector Motor Vehicle Department.
Welshaar, L. J.	Standardization Inspector, State Department of Agriculture, Sacramento	Apple inspector.
Weldon, G. P.	Chief Deputy, State Commission of Horticulture	Assistant Secretary Commission of Horticulture.
Wely, R. W.	Elevator Inspector, Industrial Accident Commission, San Francisco	Elevator inspector.
Wilson, S. B.	Member State Board of Education, Los Angeles	Assistant secretary in charge of credentials, credential clerk.
Wing, Prof. C. E.	Professor of Civil Engineering, Stanford University	Civil engineer III (promotional), construction engineer, engineering draftsman III.
Winslow, G. R.	Division Engineer, California Highway Commission, Sacramento	Civil engineer III (promotional), construction engineer, engineering draftsman III.

LIST OF PERSONS WHO ASSISTED IN CONDUCTING EXAMINATIONS DURING THE BIENNIAL PERIOD 1913 - 1920—Concluded.

Name	Business or Profession.	Examination.
Wisler, R. L.	Donaldson Publishing Company, San Francisco.	Printing office positions, elevator inspector.
Wood, E.	Elevator Inspector, Industrial Accident Commission, San Francisco.	Elevator inspector.
Wood, Will C.	State Superintendent of Public Instruction, Sacramento.	Director of community organization, director of teacher training, Preston and Whittier positions, teacher Sonoma, State Home, assistant supervisor in physical education (medical).
Woodson, J. B.	Division Engineer, California Highway Commission, Fresno.	Engineering draftsman II, civil engineer II, junior engineering assistant.

O



BIENNIAL REPORT

OF THE

Board of

State Harbor Commissioners

FOR THE

Fiscal Years Commencing July 1, 1918, and Ending
June 30, 1920

COMMISSIONERS

JOHN H. McCALLUM, President

HARRY H. COSGRIFF

FREDERICK S. MOODY



CALIFORNIA STATE PRINTING OFFICE
J. M. CREMIN, Superintendent
SACRAMENTO, 1921

BOARD OF STATE HARBOR COMMISSIONERS.

JOHN H. McCALLUM, *President*-----Commissioner
HARRY H. COSGRIFF-----Commissioner
FREDERICK S. MOODY-----Commissioner

HILDA GOHRMAN-----Secretary
JAMES BYRNE, JR.-----Assistant Secretary
FRANK G. WHITE-----Chief Engineer
DANIEL A. RYAN-----Attorney

OFFICE: UNION DEPOT AND FERRY HOUSE,
SAN FRANCISCO, CALIFORNIA.

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LETTER OF TRANSMITTAL.

SAN FRANCISCO, CALIFORNIA,

December 1, 1920.

*To His Excellency, HON. WM. D. STEPHENS,
Governor of the State of California.*

SIR: As required by law, the Board of State Harbor Commissioners for the harbor of San Francisco herewith respectfully submits its biennial report for the fiscal years commencing July 1, 1918, and ending June 30, 1920, embracing a full report of all moneys by them received and disbursed, describing the improvements made or under way, and the general conditions of the harbor property.

We have the honor to be,

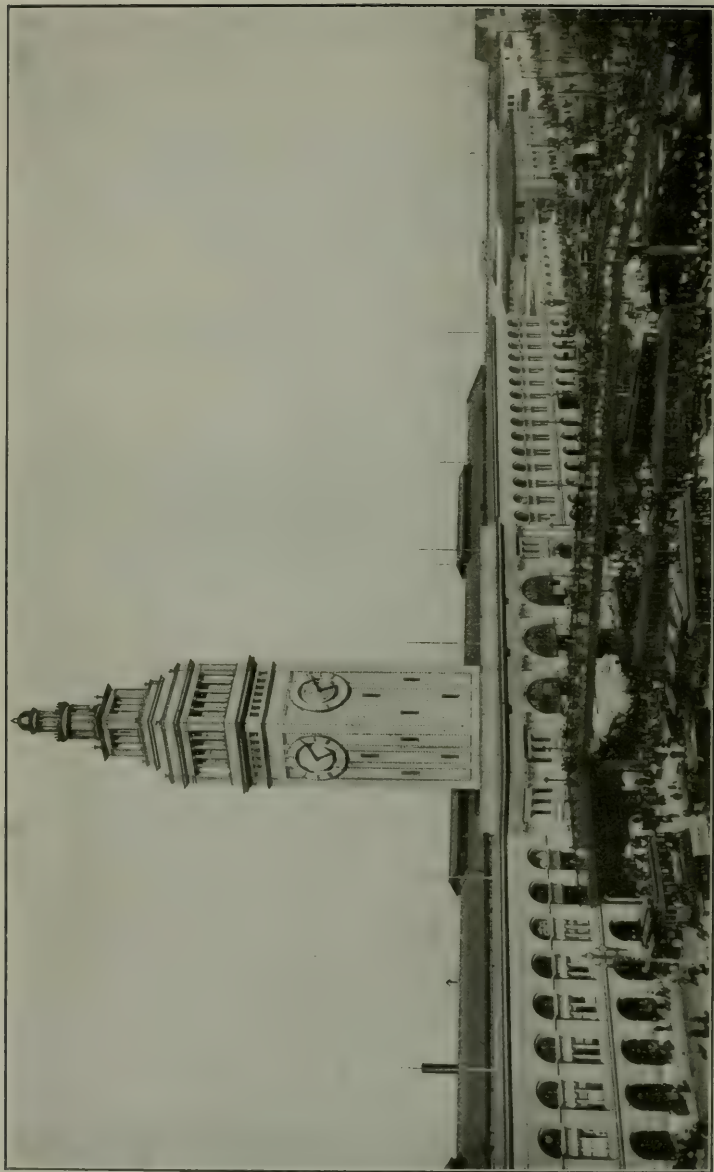
Yours very respectfully,

J. H. McCALLUM, President

H. H. COSGRIFF,

F. S. MOODY,

Board of State Harbor Commissioners.



Ferry Building—Commuters Using Viaduct at Evening Hour.

INTRODUCTION.

PERSONNEL.

The present Board of State Harbor Commissioners consists of the following Commissioners:

JOHN H. MCCALLUM, President, HARRY H. COSGRIFF and FREDERICK S. MOODY.

CHANGES IN BOARD.

Appointments—Miles Standish, December 6, 1918; F. S. Moody, March 1, 1920.

Resignations—Arthur Arlett, President, December, 1918; Miles Standish, February 29, 1920.

Elections—John H. McCallum, President, December 13, 1918.

JURISDICTION, PUBLIC OWNERSHIP AND OPERATION.

Unlike most of the leading seaports of the United States, San Francisco enjoys the advantage of a harbor front that is owned and operated by the public. The title of the property is in the State of California, and harbor affairs are administered by a board of three Harbor Commissioners, appointed by the Governor of the state and holding office during his pleasure.

The only harbor under the jurisdiction of the Board of State Harbor Commissioners is that portion of the water front on the Bay of San Francisco around the city and county of San Francisco, from the Presidio, the United States Military Reservation on the north, thence around the bay front to the boundary line between San Francisco and the county of San Mateo, and more particularly described elsewhere in this report. Only the commerce, construction, maintenance and operation of this water front is dealt with in this report. On the other side of the bay, at Oakland, Richmond and Port Costa, local bodies administer their respective harbor facilities.

The statistics and other data herein contained refer only to the state property along the San Francisco water front, consisting of a seawall; seawall lots, beyond the same, created by the reclamation of tidelands; The Embarcadero, and other water front streets; the Belt Railroad; tugs and dredgers, and all the piers and wharves in the city and county of San Francisco, except those belonging to the federal government at the Presidio and Fort Mason and those belonging to the Bethlehem Ship Building Corporation (formerly the Union Iron Works) at China Basin and Hunter's Point, and those of the Western Sugar Refinery at the foot of Twenty-third street, and these are dealt with only in the data showing the total tonnage passing through the port, as given in the secretary's report.

EXTENT OF SEAWALL, DOCKS AND LANDS.

The present water front of San Francisco in active use is approximately five miles in length. On June 30, 1920, there were in existence



PIERS 29 AND 31. FOOT OF SANSOME ST., SAN FRANCISCO

Embarcadero, Looking South from Piers 31 and 29.

along this line 15,000 feet of completed seawall, 39 piers, and certain other smaller bulkhead and other open wharves, 28 seawall lots of land, having a total area of approximately 5,000,000 square feet, valued at more than \$5,000,000, together with the tract of about 25 acres, leased for 50 years to the Atchison, Topeka, and Santa Fe Railway Company as its China Basin Terminal.

By the progressive construction of a permanent seawall around the water front on the line fixed by law, important land areas between it and the previously existing city front have been reclaimed and become the property of the state and have been devoted to harbor uses. The so-called seawall lots under the jurisdiction of the Board and devoted to railway use and other purposes were thus reclaimed.

The piers and bulkhead wharves offer about 15 miles of berthing space at the present time, and the system can be expanded, as the population and commerce demand, until it will cover 50 miles.

In addition to the property located on the active water front the state owns 141 acres of partially submerged land, bounded by Islais Channel, Waterfront street, India Basin and Arthur avenue. On the filled portion of this land is located the Islais Creek Vegetable Oil plant.

The Belt Railroad has a total trackage of 54.26 miles.

THE HARBOR SELF-SUPPORTING.

Under the law, the harbor has been self-supporting since its inception. All the cost of construction and maintenance of seawalls, buildings, wharves, etc., as well as the operating expenses, are paid out of harbor receipts. These are derived from charges imposed upon shipping and cargoes, in the form of rents, tolls, dockage and wharfage for the use of the wharves; switching charges on the Belt Railroad; from the rental privileges of the seawall lots and of the Ferry Building and other buildings and for the use of the ferry slips, and other lesser sources. The principal and interest of all bond issues must also be paid out of the same revenues. San Francisco harbor thus pays its own way, not a dollar coming out of the public treasury or taxes.

The advantage of public ownership to the shipping interests is shown by the provision of the law that harbor charges must not exceed the amount necessary to meet operation, repair and construction expenses and redeem bond issues.

TOWAGE, PILOTAGE AND STEVEDORING.

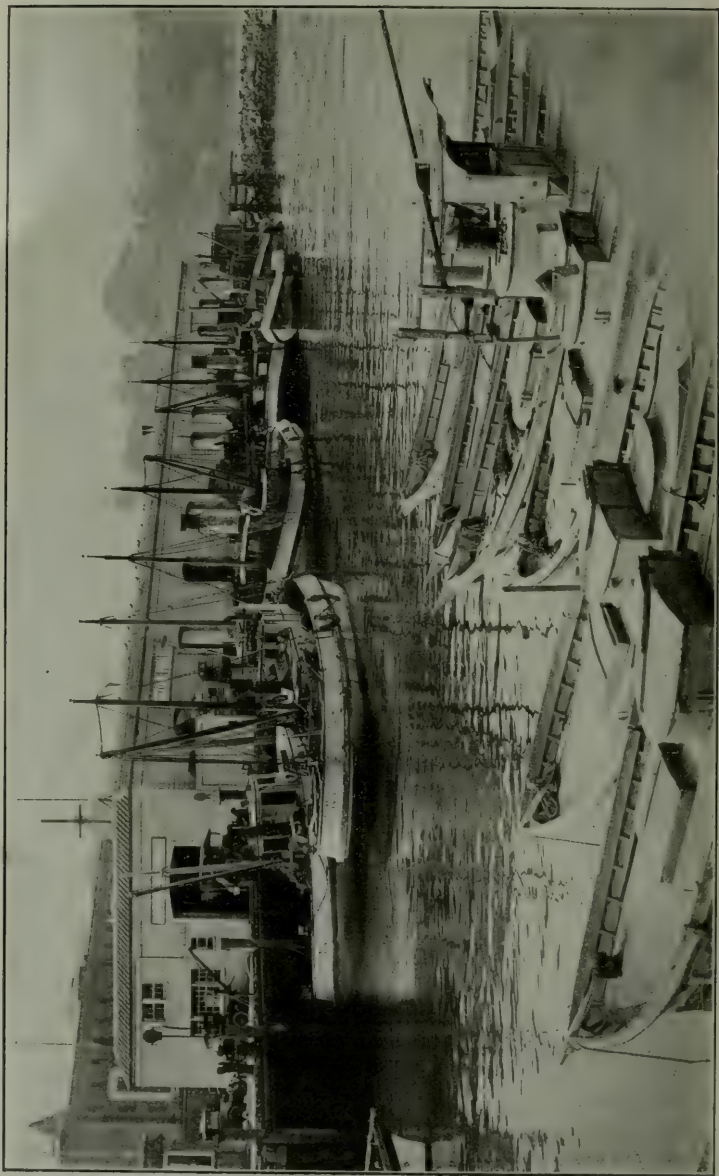
The charges for towage and pilotage from the Pacific Ocean into San Francisco Bay are contained herein as matters of general information, but are not in any degree under the jurisdiction of the Board of State Harbor Commissioners.



Completed Shed and Bulkhead Building, Piers 31 and 29.

PART I.

REPORT OF THE BOARD.



One of the Fish Packing Houses Erected at Fisherman's Wharf.

REPORT OF GENERAL CONDITIONS CONCERNING SAN FRANCISCO HARBOR UNDER PRESENT ADMINISTRATION.

CHANGES IN THE BOARD AND STAFF.

The changes in the Board's personnel are as indicated in the introduction: Mr. J. H. McCallum was elected President of the Board on December 13, 1918, upon the acceptance of the resignation of Arthur Arlett and the appointment of Miles Standish as a member of the Board; Mr. F. S. Moody became member of the Board on March 1, 1920, upon the resignation of Mr. Standish. Despite changes the Board has continued to function smoothly, and work has progressed.

The Board's staff has undergone some distinct changes during the past two years.

On December 4, 1918, Miss Hilda Gohrman, former private secretary to President Arlett, was because of her knowledge of the work of the Commission appointed Secretary of the Board *vice* Harry H. Cosgriff, appointed Commissioner, Miss Gohrman thus becoming the first woman occupying this position.

In February, 1919, the Board having adopted a new system of Port Revenue, and feeling that the port of San Francisco needed further advertising and new business, appointed as its business solicitor Mr. Walter A. Sweat, with title of Traffic Manager.

LEGISLATION, 1919.

Looking to the best interests of the port of San Francisco, and the better administration of the affairs of the Board, the Board of State Harbor Commissioners secured the passage during the session of the 1919 Legislature of the following acts:

The Insurance Bill.

Act shown in chapter 168, page 254, Statutes and Amendments to the Codes, California, 1919, commonly known as the "Insurance Bill."

This act has enabled the Board to insure the property under its jurisdiction to the maximum sum of \$2,000,000, increasing the insurance permitted by the Act of 1915, \$800,000. As the property covered by this insurance is inventoried elsewhere in this report in excess of \$16,000,000 the necessity of the increased insurance was an urgent one. The bill further provides that new construction may be insured to 25 per cent of its value irrespective of the other insurance carried.

The Warehouse Bill.

Act shown in chapter 169, page 254, Statutes and Amendments to the Codes, California, 1919, commonly known as the "Warehouse Bill."

Under this act the Board is permitted to build, or operate warehouses, in which business it was necessary that the Board engage in the operation of the vegetable oil plant contemplated at the time of the issuance of



Barrel Oil Discharged from Steamer at Islais Wharf.

the last report, as well as in the operation of the warehouses contemplated.

The Leasing Bill.

Act shown in chapter 167, page 252, Statutes and Amendments to the Codes, California, 1919, commonly known as the "Leasing Bill."

This bill permits the leasing of certain lands adjoining the contemplated vegetable oil plant location, it being the intention of the Board at the time of the passage of the act, which intention has since been carried out, to lease small pieces of land to importers and exporters of Oriental vegetable oils on which to erect tanks for the storage of their own oils: By this method the Board hoped to partially insure the success of the vegetable oil terminal by providing that those using the plant should be in a measure financially interested, and thereby lessen the Board's investment to that extent.

The Fishing Boat Bill.

Act shown in chapter 235, page 343, Statutes and Amendments to the Codes, California, 1919.

This act amends section 2524 of the Political Code by providing that the Board may readjust rates of dockage as applied to fishing boats.

The Pay Roll Bill.

Act shown in chapter 302, page 486, Statutes and Amendments to the Codes, California, 1919, amending section 2528 of the Political Code, so as to facilitate the prompt payment of salaries to the Board's employees.

CHANGE IN SYSTEM OF PORT REVENUE.

At the time of the issuance of the last biennial report the Committee on Port Revenue appointed by the Board, composed of shipowners, operators, importers and exporters, had rendered their report recommending for adoption by the Board a new system of port revenue. This report was rendered on October 4, 1918.

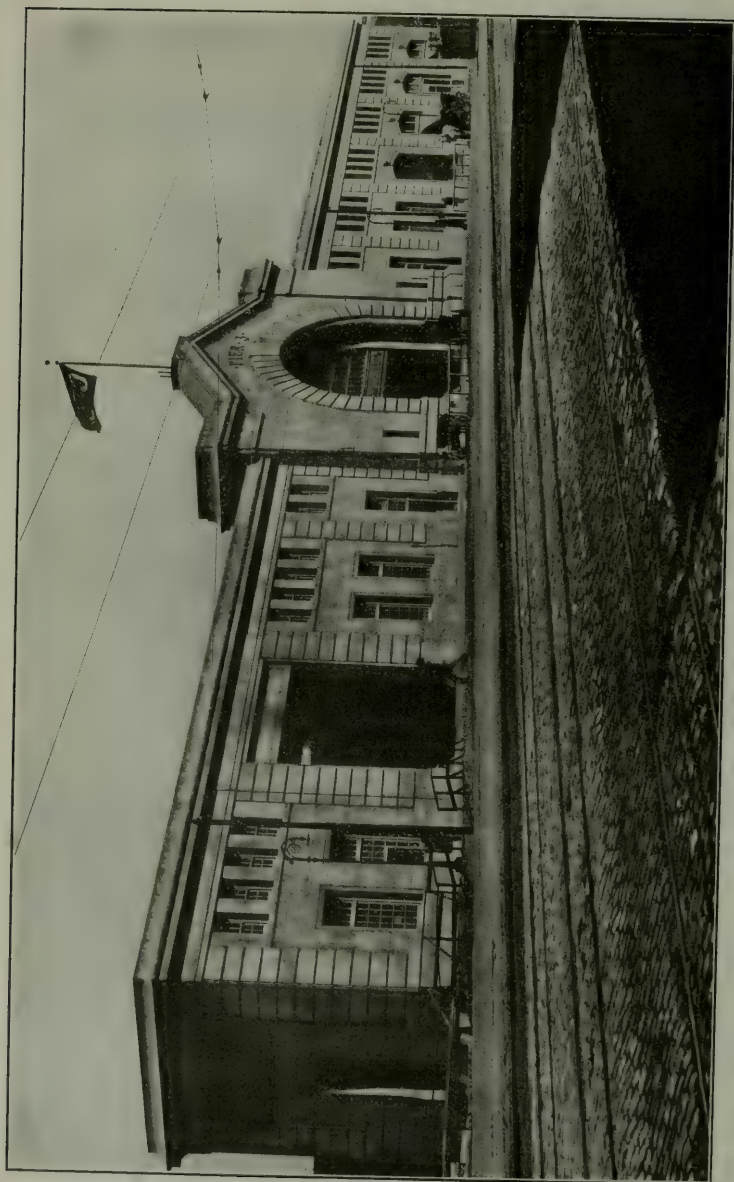
On October 8 to 10, 1918, there was adopted at a meeting of the Pacific Coast Association of Port Authorities resolutions calling for the appointment of a committee to recommend to the various port authorities and dock operators a uniform system of charges, such recommendations to be made after a meeting held in San Francisco for that purpose, and further requesting that the United States Railroad Administration adjust the absorption of port charges in the various Pacific Coast ports to the end that no discrimination should be made between the ports.

This committee met in San Francisco in December, 1918. At the meeting were present representatives of all the Pacific Coast ports, Chamber of Commerce and the Railroad Administration, and at such meeting the following recommendations for uniformity of practice at Pacific Coast ports were adopted:

First—That the rail carriers be requested to deliver outbound cargo to the pile on the wharf, and take inbound cargo from the pile on the wharf.

Second—That the cost of handling freight between the ship's hold and the pile on the wharf should be made fair and reasonable at all ports. This charge or cost to be paid by the ship in all cases.

Third—That the United States Railroad Administration be requested to make an adequate and uniform charge at all ports, for the use by ships of railroad-owned wharves or docks. In the interest of fair com-



Pier 3—Assigned to River Business.



Pier 3—Water Side, Showing Small Passenger Pier.

petition it is recommended that this charge shall be in addition to the inland carriers transportation charges.

In February, 1919, no action having been taken by the other Pacific Coast ports as to any change in their system of port revenue, the Board adopted the changes in port revenue as recommended by its Committee on Port Revenue, to be effective April 1, 1919, as follows:

Vessels engaged in foreign and off-shore trade were given free dockage and pier rental;

Tolls on the cargo carried by vessels engaged in foreign and off-shore trade were increased approximately from 5c to 15c per ton;

Where pier assignments were required for the convenience of steamship companies engaged in carrying foreign cargo, rentals were reduced one-half of \$.006 per square foot per month; and in order to insure the prompt removal of cargo from the docks, and prevent their usage as warehouses, demurrage rules were adopted providing that—

Discharged domestic cargo must be removed therefrom 5 days after the vessel finished discharging and providing a penalty for failure to comply with such rules;

Discharged foreign cargo must be removed therefrom 10 days after the vessel completes discharge; and a penalty provided for failure to so comply.

The adoption of this system of revenue placed San Francisco on a parity with the other so-called "free ports," on the Pacific Coast, and granted free dockage to vessels engaged in foreign trade.

This system, while a distinct departure from the old system, having been inaugurated and fostered by both shipping men and merchants has met with no opposition, but with very great favor.

The system further contemplates that a pier assignment might only be obtained by a steamship company maintaining a sufficient number of sailings.

Since the installation of the new system of port revenue, statistics have been compiled showing the use of docks, and pier assignments have been rearranged so far as possible to bring together in convenient locations ships engaged in the same character of business, and an attractive new tariff issued showing the new rates.

Nothing was heard from the request to the United States Railroad Administration in the matter of the uniformity of absorption of port charges until September, 1919, when it was announced that the Railroad Administration would absorb Belt Railroad charges on through freight landed in San Francisco; the carriers being required to deliver cargo to the pile on the wharf and so receive it; the steamship companies to

pay the cost of handling from the hold of the ship to the pile on the wharf and from the pile on the dock to the hold of the ship.

The Board believes its efforts in this direction have been well repaid.

BOND ISSUES.

Policy of Board as to Improvements.

For the purpose of reconstructing and developing the properties of the state on the water front of San Francisco the voters of the State of California have been called upon to vote bonds to provide the necessary funds. The principal and interest on all bonds are payable out of harbor revenues, although the bonds have the credit of the state behind them.

It might be interesting to note the vote cast for the various bond issues:

San Francisco Harbor Improvement Act of 1909; \$9,000,000, election Nov. 8, 1910—

For the bonds	130,115
Against the bonds.....	41,831

All the funds provided by the sale of these bonds have been expended for new improvements, a detailed list of which has been published in prior reports.

India Basin Act of 1911; \$1,000,000, election 1911—

For the bonds	103,051
Against the bonds.....	65,897

These bonds were voted for the purpose of acquiring the 63 blocks of land in the India Basin, now known as the Islais Creek lands. However, only the sum of \$853,000 was expended in the purchase of such property, and the remaining bonds will be cancelled as unavailable for any other purpose than the purchase of the lands.

San Francisco Harbor Improvement Act of 1913; \$10,000,000, election 1913—

For the bonds	408,633
Against the bonds.....	167,589

There is therefore available for future development of the port \$8,000,000 which insures all the contemplated improvements and development contemplated for some time to come. Nevertheless the affirmative vote on bond issues for the port of San Francisco, as shown above, indicates

that the voters of the State of California would not hesitate to vote further bonds for its development should such need be shown.

LANDS ACQUIRED; SETTLEMENT OF ISLAIS CREEK CONDEMNATION SUIT.

Since the rendition of the last report, the entire property consisting of 63 blocks bounded by Islais Channel, Waterfront street, India street and Arthur avenue has been acquired and undisputed title now rests with the state.

A compromise settlement was made by the Board with the remaining landholders after numerous conferences held with experts in land values, merchants and steamship owners vitally interested in the development of the port, and the State Board of Control, whereby the total holdings were acquired by the state for the total sum of \$863,000—\$137,000 less than the amount of the bond issue voted for the acquisition of the India Basin property and a million less than the original price demanded by the property owners. This settlement was confirmed by the Court on November 19, 1919, thus completing a legal battle extending over a period of years.

Five blocks of this property had already been reclaimed when the state came into possession of the tract, and upon this five blocks is located the vegetable oil terminal.

The acquiring of this large piece of property, at so moderate a sum, together with other water front property owned by the state, gives assurance of ample room for the development of the harbor and sufficient to take care of the commerce of the port for many years to come.

ADVISORY BOARD.

The assistance rendered to the Board by the Committee on Changes in Port Revenue was of such inestimable value that the Board conceived the idea that it would be for the best interests of the port if a group of experienced men doing business in the port of San Francisco could be called upon to render assistance in an advisory capacity from time to time. Accordingly, the Board selected, as such committee, twenty men engaged in various activities connected with the shipping world, importers and exporters, shipowners and operators, representatives of railroad companies, stevedores, warehousemen, draymen, and the Chamber of Commerce. Upon appointment this group of men met in the office of the President of the Board and organized themselves under the name of the Advisory Committee to the Board of State Harbor Commis-

sioners, with Captain Dollar as chairman, and divided their activities as follows:

Foreign Commerce;
Ships and Shipping;
Transportation;
Harbor Extension;
Wharves and Equipment;
Warehouse and Drayage.

The committee as a whole has met on numerous occasions with the Board for consultation, and the subcommittees have been conferred with from time to time on matters relating to their activity.

The Board wishes in this report to acknowledge with very great appreciation the unselfish and loyal assistance rendered to the Board by this committee in dealing with problems affecting the port.

CONSTRUCTION.

During the biennial period the Board has not stressed the matter of extensive improvements due to the high cost of building and the further fact that improvements on the water front had kept pace with the tonnage passing through the port.

Early in the period the Board developed a policy of making such improvements as were absolutely necessary out of current revenue only, and such policy has been continued up to the present time, only about \$500,000 of bond money having been used for improvements during that period.

All property has been kept in repair and maintained in first class condition. There has been paid out of current revenue for permanent improvements and equipment during the period \$1,282,618.96, which has been expended as follows:

Piers, wharves, etc.	\$712,847 47
Buildings	97,584 45
Belt Railroad	173,639 82
Viaduct	42,789 94
Islais oil plant	178,284 15
Seawalls	2,318 90
Sewers and paving	39,336 76
Street lighting	14,866 74
Cargo Handling (tractors, pilers, etc.)	33,877 39
Fire protection (chemical fire extinguishers, etc.)	34,308 50
Miscellaneous	33,045 41

The engineer's report shows a detailed account of all improvements, but a brief statement of the principal improvements in addition to the viaduct and Islais Creek oil plant mentioned separately shows:

Piers 31 and 33 completed and the contracts for sheds on both piers let and the work completed. In building shed on Pier 31 the shed was extended to cover the bulkhead between Piers 29 and 31 so that

Piers 29 and 31 are now connected by a splendid bulkhead building which is used frequently for the storage of cargo awaiting shipment.

Piers 43, 21 and 25 have also been extended approximately 200 feet to the pierhead line.

The work of extending Pier 20, 160 feet, was commenced on June 30, 1920.

The bulkhead wharf at Pier 27 has been completed.

At Fishermen's Wharf considerable development has taken place. New wharves for fishing boats have been built; Taylor, Jones and Leavenworth streets have been opened up and paved, giving Fishermen's Wharf district new access to the city, and fish packing houses have been erected, which are now occupied by the F. E. Booth Company, Borzone Fish Company and the Western California Fish Company, the largest fishing concerns in San Francisco. For the convenience of the fishermen located at Fishermen's Wharf new shops have been constructed to facilitate the repair and building of fishing craft.

An addition has also been built to the Post Office Building adjoining the Ferry Building.

A new office has been constructed for the superintendent of the Belt Railroad, as well as new Belt Railroad oil tank and sand house.

ISLAIS CREEK VEGETABLE OIL PLANT.

Upon the settlement of the suit for the condemnation of the Islais Creek lands, the board proceeded at once to erect and equip a vegetable oil plant for the port of San Francisco. This plant, as described in the report of the engineer herein, while not complete, was put into partial operation February 1, 1920, and in full operation April 1, 1920.

The operation of a well equipped vegetable oil terminal being a new venture for the port, the board deemed it advisable to secure in the management and superintendence of the plant the services of a firm or individual experienced along such lines as well as in the soliciting of business. Therefore, after consultation with the importers and exporters who had been most active in the location of a vegetable oil plant at San Francisco, and who expected to lease lands in immediate proximity to the plant for the erection of tanks and the storage of their own oils, the board employed the Associated Terminals Company, a firm then operating a vegetable oil plant at China Basin, as superintendent and manager of the plant for the period of one year, under a contract which provided that such company should cease to operate its China Basin plant.

The State Islais Creek Oil Plant, as the vegetable oil terminal is called, has been in full operation only three months, but has proven that it is meeting a much needed want in San Francisco, the gross returns from the plant during that period being the sum of \$36,083.39,

and there has been handled through the plant since its operation coconut oil, cottonseed oil, peanut oil and soya bean from the Orient, and coconut oil from the Philippines and the East Indies, as well as other oils in minor quantities. Large quantities of oil have been diverted to this port which otherwise would have been shipped to other ports.

Up to the present time most of the oil handled at the plant has been discharged at other piers and delivered by barge or the "Mohican," the oil tank barge belonging to the board at the Islais Creek plant. It is believed that in the future many vessels will dock at the Islais Creek wharf adjoining the plant and discharge their case or barrel oil directly at the plant.

The Islais Creek channel leading to the oil plant has been dredged to a depth of 25 feet at low tide, a sufficient depth to permit the largest vessels to dock at the terminal. The "Eastern Importer," with a net registered tonnage of 3,586 tons and a depth of 36 feet, was the first vessel to dock at the plant and discharge its oil, and it is hoped and believed that she will be the forerunner of many other vessels.

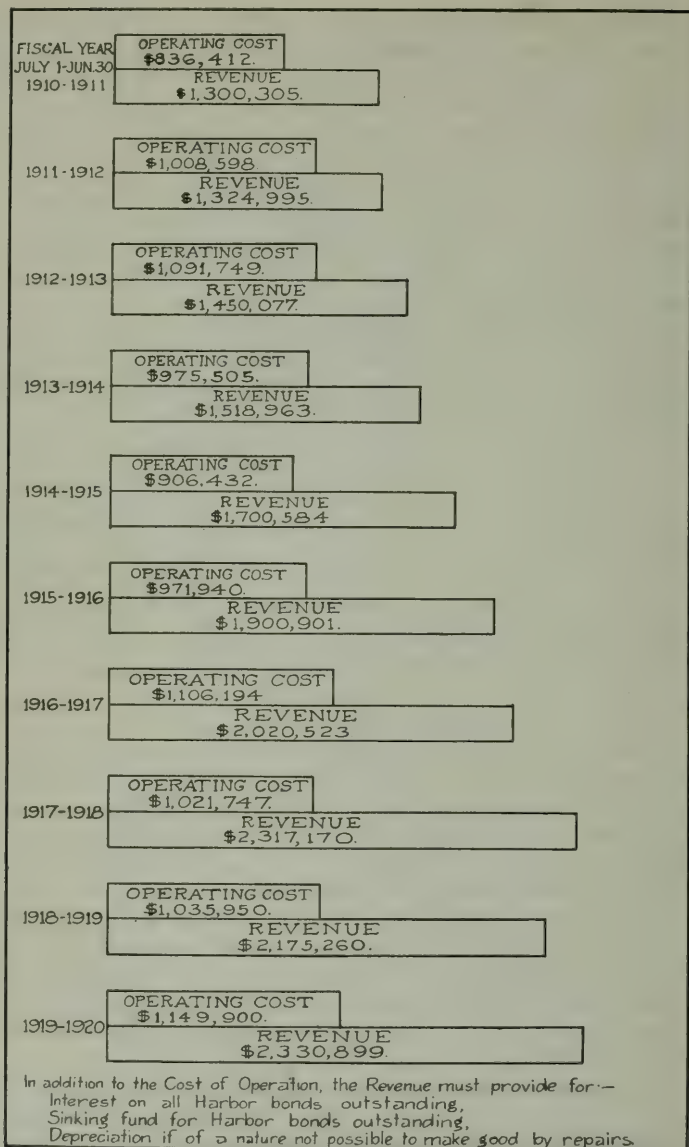
Five firms have taken advantage of the opportunity offered by the board, and leased lands adjoining the plant for the storage of their own oils, and there are at this time erected, or in process of erection on property so leased, tanks for Hind. Rolph and Company, Balfour, Guthrie and Company, H. W. Peabody and Company, S. L. Jones and Company, and Willits and Patterson. The rental of this land gives to the board a revenue of \$437.50 per month.

BELT LINE.

The service performed by the Belt Railroad is becoming increasingly valuable with the development of the port. It is a recognized fact that the service rendered by the Belt to industries located on the system and to all the piers is without equal at any port terminal in this country. There is no limit to the number of switches made per day to either piers or industries.

The superintendent of the Belt Railroad has rendered the board a detailed report relative to the activities and operation of the Belt Railroad, which report, while not strictly a report of operations for the past two years, is, nevertheless, attached as being a most excellent presentation of the Belt Line, its activities and its work during the past two years.

By this report and in the report of the engineer it is shown that during the biennial period the Belt Line facilities have been extended by the addition of new tracks on Piers 3, 5, 27, 31 and 33 and the installation of Belt Line tracks on Piers 21 and 43, as well as by the



COMPARATIVE DIAGRAM SHOWING REVENUE AND COST
 OF OPERATION OF PORT FACILITIES SINCE JULY 1, 1910.

TOTAL AREA OF PIERS IN SERVICE - SQ. FT.

IN ADDITION THE FOLLOWING CARGO WAS HANDLED OVER PRIVATE WHARVES,
(U S TRANSPORT, BETHLEHEM STEEL AND WESTERN SUGAR REFINING CO.) }

2,183,308 SQ. FT.
TOTAL TONNAGE
6,629,122

3.03
TONS PER SQ. FT.

2,218,848 SQ. FT.
TOTAL TONNAGE
6,796,726

3.06
TONS PER SQ. FT.

2,320,843 SQ. FT.
TOTAL TONNAGE
7,528,965

3.28
TONS PER SQ. FT.

2,850,549 SQ. FT.
TOTAL TONNAGE
7,253,896

2.54
TONS PER SQ. FT.

3,377,691 SQ. FT.
TOTAL TONNAGE
7,947,117

2.35
TONS PER SQ. FT.

4,024,832 SQ. FT.
TOTAL TONNAGE
8,900,255

2.21
TONS PER SQ. FT.

3,861,454 SQ. FT.
TOTAL TONNAGE
9,389,417

2.17
TONS PER SQ. FT.

4,182,944 SQ. FT.
TOTAL TONNAGE
9,707,612

2.32
TONS PER SQ. FT.

4,629,466 SQ. FT.
TOTAL TONNAGE
8,678,791

1.88
TONS PER SQ. FT.

5,129,947 SQ. FT.
TOTAL TONNAGE
8,916,798

1.74
TONS PER SQ. FT.

Vertical Scale

Horizontal Scale

1 MILLION SQ. FT.
0 1 2 3 TONS

AVERAGE NO. OF TONS HANDLED PER SQ. FT. OF PIER AREA

COMPARATIVE DIAGRAM OF PIER AREAS AND TONNAGE HANDLED, BY FISCAL YEARS

463,142 Tons 550,000 Tons 519,768 Tons 740,494 Tons



The Channel at Islais Creek Vegetable Oil Plant is Sufficiently Deep for the Largest Vessel to Berth at the Dock. These Pictures Show the "Eastern Importer," the First Vessel to Dock at the Pier.

addition of spur tracks connecting the vegetable oil plant at Islais Creek with main lines.

As has been stated, it is the policy of the board to extend the Belt Line facilities in the same proportion as shipping facilities are built, and the Belt Railroad will serve the territory adjacent to the waterfront and on any public street where the authorities of the city of San Francisco will permit the laying of tracks.

In addition to the new trackage enumerated, during the past two years perhaps the most important addition to the Belt Railroad facilities was the construction of a so-called "interchange yard" on the property adjacent to First and Berry streets and The Embarcadero and on The Embarcadero to Brannan street.

New storage tracks and team tracks were laid on and adjacent to Seawall lots 17, 18 and 20. Four transfer tracks were provided with interchange track between the Belt Line Railroad and the Southern Pacific Company. By this means the Belt Railroad is able to handle not only an increased number of cars with greater facility, but at a decreased cost per car.

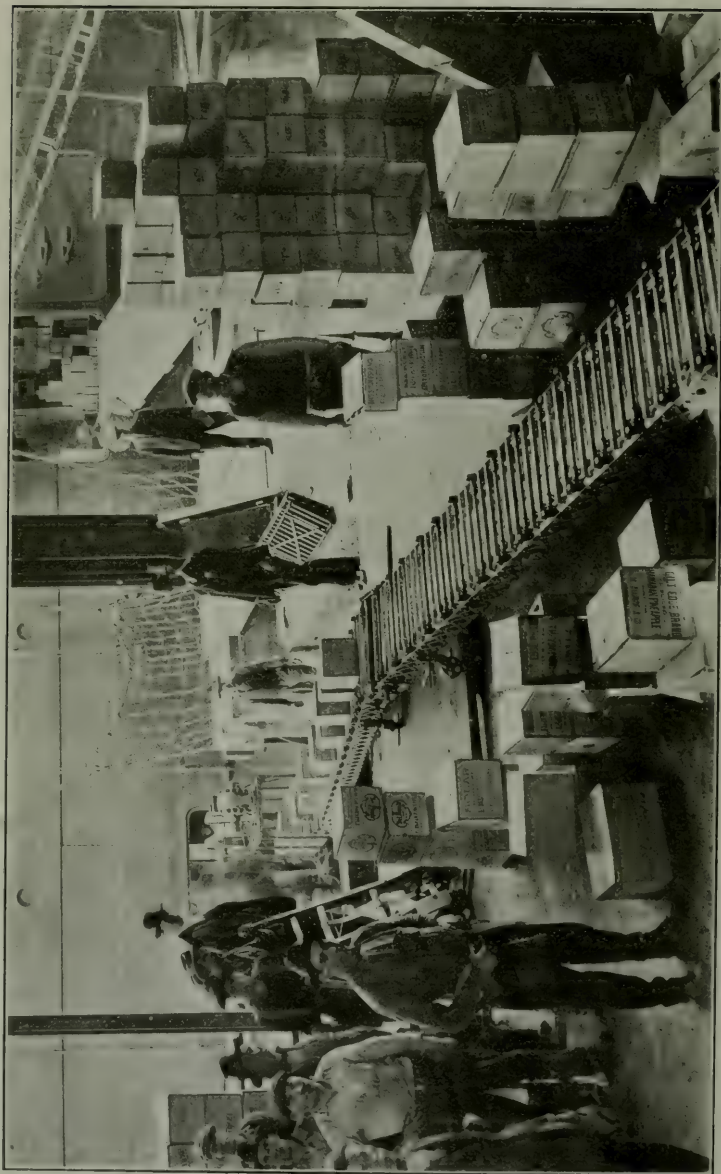
The additions to the Belt Railroad during the biennial period aggregated 3.45 miles in length, making total mileage of Belt Line Railroad on June 30, 1920, 54.26 miles.

On March 1, 1919, the board reduced the switching charge from \$3.25 to \$2.50, but owing to the fact that the period was one in which the cost of labor and materials rose greatly, it soon became evident that the Belt Railroad could not be self-sustaining on such a basis and that a rate of at least \$3 per car must be obtained in order to make the Belt Railroad self-supporting. Therefore, on April 15, 1920, the rate was increased from \$2.50 to \$3 per car.

CARGO HANDLING.

Since the rendition of the last report the Board has wired Piers 21, 25, 29, 31, 33, 41, 30, 32, 36, 38 and 40 for light and power, in order to permit of the installation and use of electric cargo handling machinery, and the Board has purchased and placed in operation, in addition to the equipment owned by the steamship companies of the port, two electric elevators, two stackers, an electric tractor, twelve trailers and two portable motor generator sets for charging batteries.

It is the Board's intention, as soon as conditions warrant, to wire all the piers for power, as the employment of mechanical handling devices is a very important adjunct to the facilities of the port. The stackers, trailers, etc., are rented by the Board to the steamship com-



Cargo-Handling Devices at Pier 32—Unloading Pineapple from Ship's Hold.

panies at rates as shown by the tariff, and additional equipment will be purchased as the need develops.

VIADUCT.

For many years an overhead bridge across The Embarcadero from the Ferry Building had been advocated by the traveling public, newspapers, public bodies, transportation companies, etc., but due to differences of opinion as to the kind and character of the bridge, the landing place, the difficulty of landing on public property, it was never built.

On June 19, 1917, the then Board approved the plans presented by Frank G. White, Chief Engineer of the Board, and on April 16, 1918, the construction of the pile foundation of the viaduct began and was dedicated on May 17, 1919, and first used by the boys of the 91st Division of the A. E. F. on their return from France, a day of civic celebration, the boys proceeding from the ferry boat across the viaduct to Market street, where a parade had formed.

Since that day many thousands of people have made use of the viaduct, and during the morning and evening rush hours it is used to capacity and has fully justified itself.

This viaduct will in time undoubtedly become as well known as the Ferry Building itself.

It is the intention of the board as time goes on and the traffic on The Embarcadero in front of the Ferry Building justifies the expenditure, to build a second viaduct on the south side of the building.

FERRY BUILDING.

During the biennial period the following new concessions and tenants were secured and the following increases of rental made:

A bakery concession has been placed in the Key Route and Northwestern Pacific waiting room, at a rental of \$700 per month.

A sea food booth and restaurant has been installed at the entrance to the viaduct, at a rental of \$200 per month.

The following increases have been effected:

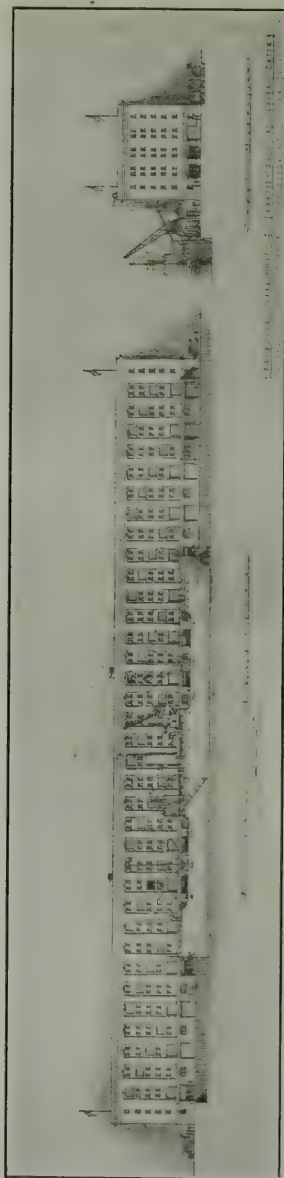
Foster & Orear, January 1, 1920, \$3,000 to \$4,000 per month.

Van Noy Interstate Company, June 1, 1919, \$350 to \$400 per month.

CONTEMPLATED IMPROVEMENTS.

Pier Extensions.

The board's program of contemplated improvements, as shown in its last report, included among other things the extension of Piers 20 and 22, 200 feet by 100 feet and the extension of Piers 34, 38, 40, 42 and 44 to the pierhead line, a distance of about 150 feet, as soon as



Proposed Warehouse and Wharf Shed at China Basin.

conditions warranted. This portion of the program remained untouched at the close of the last biennial period, so, therefore, the extension of Piers 20 and 22 are contemplated improvements of the immediate future, and the extension of Piers 34, 38, 40, 42 and 44 contemplated improvements for a later date.

Two-Story Shed.

Similarly the erection of a two-story shed on Pier 39, contemplated for erection within this biennial period, still remains on the program of the Board for erection within the new biennial period.

Pier No. 1.

Since the rendition of the last report Pier No. 1 has been torn out, but the erection of a new Pier No. 1, to be the first pier immediately north of the Ferry Building, reinforced concrete 138 feet by 550 feet, designed particularly for the handling of bay and river traffic, remains as one of the most important improvements to be made by the Board in the near future.

Bulkhead and Bulkhead Wharf Buildings.

As shown in the report of the Engineer, new plans include the necessary erection of new reinforced concrete bulkhead wharves between Pier 19 to 25, 745 feet in length and 46 feet in width, the erection of a bulkhead wharf building in front of Pier 27 and between Piers 27 and 25, 318 feet in length and 70 feet in width; also bulkhead wharf building in front of and adjacent to Piers 5 and 9.

Warehouse.

The Board has approved plans for the building of a seawall extending from Third street, near the northerly end of the Channel street bridge to The Embarcadero adjacent to Pier 46 and along The Embarcadero, to connect with the existing seawall, and for the erection thereon, after filling, of a bulkhead wharf 990 feet long.

The improvement of the property as outlined and as shown on the plans will provide the following additional facilities:

A wharf 990 feet in length provided with a shipside track.

The building as shown on the plans is a combined wharfshed and warehouse 816 feet in length and six stories in height. The width on the main floor is 123 feet; on the second floor, 100 feet, and on the four warehouse floors, 100 feet. These widths are secured by stepping back on the wharf side, and this plan was adopted in order to locate the foundations of the wall of the main building inside the bulkhead wall. By this means also there are provided landing platforms at the

level of the second and third floors. By the use of revolving, semi-portal electric cranes it will be possible to handle cargo between the ship and the first, second and third floors of the building in one operation.

Whip hoists mounted on the roof will serve the three upper floors on the wharf side, and elevators and other conveying equipment will be provided inside the building.

Three depressed tracks are planned behind the building, and these will also serve the industrial property which will be available between these tracks and Berry street.

The combined wharfshed and warehouse, six stories in height, will provide floor areas as follows: First floor: 100,370 square feet; second floor, 89,760 square feet; third, fourth, fifth and sixth floors, 81,600 square feet each.

Assuming that the first and second floors are used as outbound and inbound transit sheds, and the other four floors for warehouse purposes, there will be provided 190,130 square feet of wharfshed space and 326,400 square feet of warehouse space.

A detailed account of this improvement is shown in the report of the Engineer.

This warehouse will bring to the port of San Francisco the facilities for handling at the water side all cargoes of seasonable freight, grain, tropical pineapple, sugar and cotton at a minimum cost for both domestic and export movement. Cargo for re-export may also be stored here. The largest ship may dock at the wharf and the cargo be placed in storage at the harbor front.

This improvement means not only a tremendous increase in cargo and dock space, but will establish a port warehousing system which, when completed, will rival anything in any port in the world.

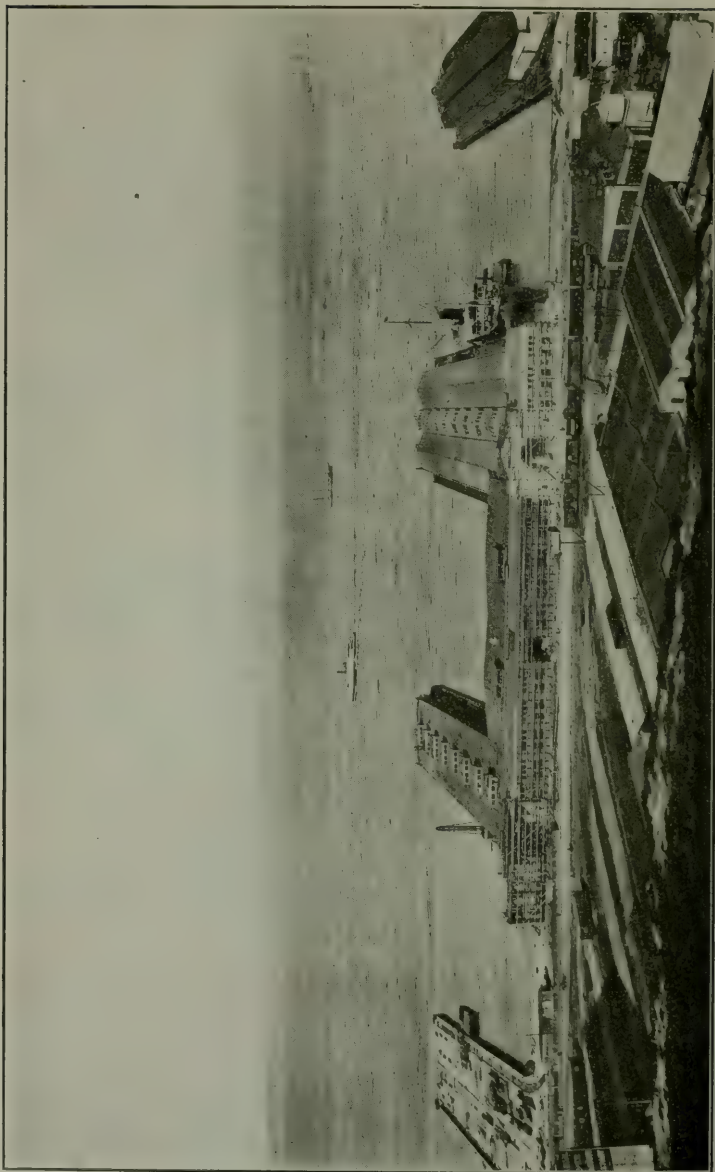
ISLAIS CREEK-INDIA BASIN IMPROVEMENT.

The development of this district, comprising 280 acres of submerged land, represents the development of the waterfront of the future.

Detail plans are shown in the report of the Engineer.

PART II.

REPORT OF CHIEF ENGINEER.



REPORT OF CHIEF ENGINEER.

July 1, 1918, to June 30, 1920.

October 25, 1920.

*To the Honorable Board of State Harbor Commissioners,
San Francisco, California.*

GENTLEMEN: I beg to submit herewith for your consideration my report as Chief Engineer of the Board of State Harbor Commissioners, for the two fiscal years beginning July 1, 1918, and ending June 30, 1920.

At the time of the presentation of the last biennial report on July 1, 1918, there were under construction the following structures:

- Pier 31, which was 97 per cent completed.
- Pier 3, shed, bulkhead building and passenger building, which were 40 per cent completed.
- Pier 33, which was 87 per cent completed.
- Viaduct across The Embarcadero.

This work was all described in the last report and the structures have all been completed and placed in service.

The construction of Piers 3, 31 and 33 completed the program of new pier construction along the active water front from Channel street to Taylor street, with the exception of Pier 1, just north of the Ferry Building. This development has more than kept pace with the increase in tonnage, and therefore it has been unnecessary to begin the construction of any new piers during the last two years. The activities of the Engineering Department have been devoted principally to the construction of several pier and wharf additions, pier sheds and other buildings, a vegetable oil terminal, in the maintenance of the water front structures and in making studies of plans for the development of the Islais Creek-India Basin district and of the property at China Basin.

For the purposes of this report, the work of the engineering department will be divided as follows:

1. Contruction, piers, wharves, etc.
2. Buildings.
3. Oil terminal.
4. Maintenance and repairs.
5. Belt Railroad.
6. Paving.

7. Electrical.
8. Dredging.
9. Testing.
10. Designing and drafting.
11. Future development.
12. Recommendations.

1. CONSTRUCTION, PIERS, WHARVES, ETC.

Pier 43, Addition.

An irregular shaped addition on the end and easterly side of Pier 43 was constructed for use in the handling of lumber and other bulk cargoes. This extension is of creosoted pile and timber construction and has an area of 41,100 square feet. One railroad track was extended to the end of the pier, which now has an area of 75,928 square feet. The addition was completed in September, 1919.

Pier 21, Addition.

Pier 21 was extended to the pierhead line by the construction of a creosoted pile timber structure with a wooden shed. The addition is 108 feet in width and 200 feet in length and carries one railroad track. The work was completed in March, 1919.

Pier 25, Addition.

Pier 25, which was 600 feet in length, was extended to the pierhead line. The addition is a creosoted pile timber structure 134 feet in width and 200 feet in length, with one railroad track. The construction of the extension was completed in December, 1919.

Pier 20, Addition.

An extension 111 feet in width and 160 feet in length is under construction at the outer end of Pier 20. The addition will not extend to the pierhead line on account of the depth of the water and soft mud at this location. Some silting has occurred since the construction of piers 24 and 18, and it is expected that in time the filling will be sufficient to permit of extending both Piers 20 and 22 to the pierhead line. Work on the addition to Pier 20 was just commencing on June 30, 1920.

Bulkhead Wharf, Pier 5.

A section of reinforced concrete bulkhead wharf 45 feet in width and 311 feet in length is under construction adjacent to Pier 5. This will connect the completed sections adjacent to Piers 3 and 7, and the permanent bulkhead wharf will then be continuous from Pier 42 to Pier 19.

This wharf is a typical reinforced concrete pile structure and carries a railroad track leading to the south side of Pier 5. Under a simultaneous contract, a depressed railroad track was constructed

extending about one-half the length of the pier, affording at this point an additional connection with the Belt Railroad.

Also, in conjunction with this wharf a creosoted pile addition is being built in the slip between Piers 5 and 7. This addition will widen the wharf 16 feet and will permit of the construction of a bulkhead shed 49 feet in width. The slip is 174 feet in width, and this berth will furnish accommodations for one or more of the smaller bay and river lines.

The track addition to Pier 5 was completed in May, 1920, and the bulkhead wharf was 53 per cent completed on June 30, 1920.

Bulkhead Wharf, Pier 27.

In order to permit of relocating the railroad track leading to the north side of Pier 27 a section of bulkhead wharf was constructed extending across approximately the northerly half of the pier. A second section is now under construction from this first section to Pier 25. These wharves are of typical reinforced concrete pile construction, 45 feet in width and having a combined length of 303 feet. The latter wharf is being widened by the construction of a creosoted pile addition 40 feet in width, extending from Pier 25 to Pier 27. This will permit of the construction of a bulkhead building 70 feet in width, which will be used in conjunction with Pier 27 for handling the large shipments of potatoes and onions from river points.

The first section of the bulkhead wharf at Pier 27 was completed in March, 1919, and the second section with the extension was 28 per cent completed on June 30, 1920.

Wharves, Fishermen's Lagoon.

Several wharves for use by the fishing industry were constructed in Fishermen's Lagoon. These wharves have a total length of 1380 feet and an average width of 30 feet. They are built on creosoted piles with concrete decks, or with timber decks covered with asphalt. These wharves were built by the Board's construction organization.

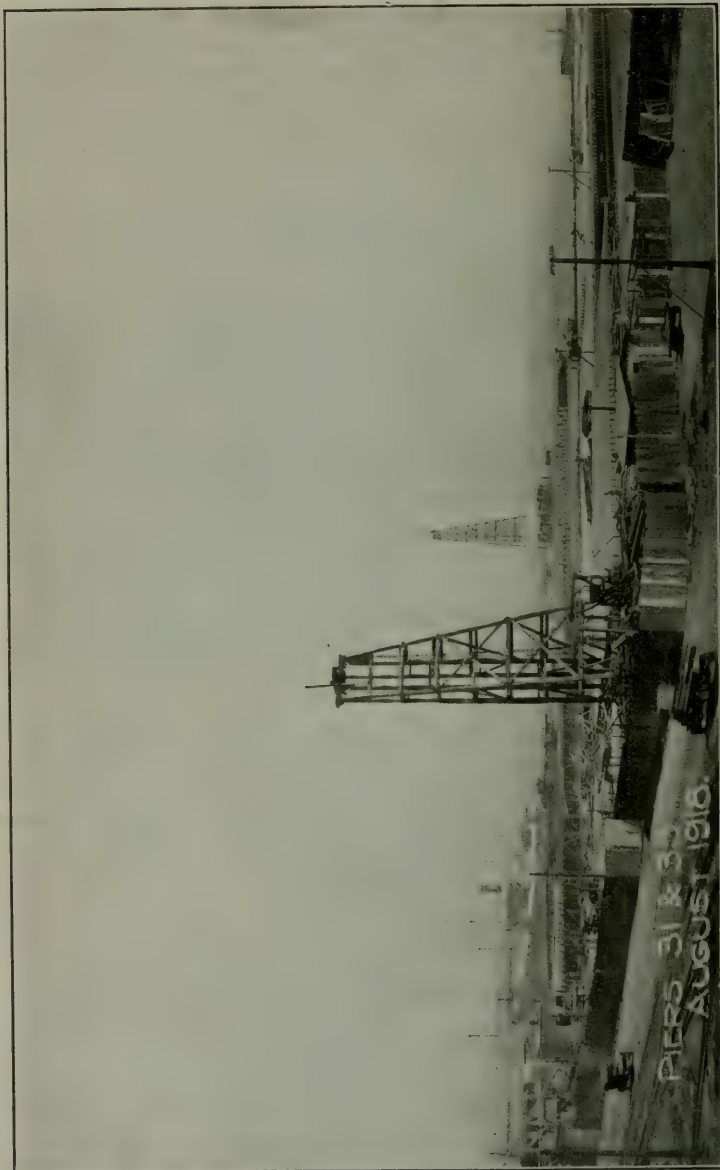
2. BUILDINGS.

Pier 31, Shed.

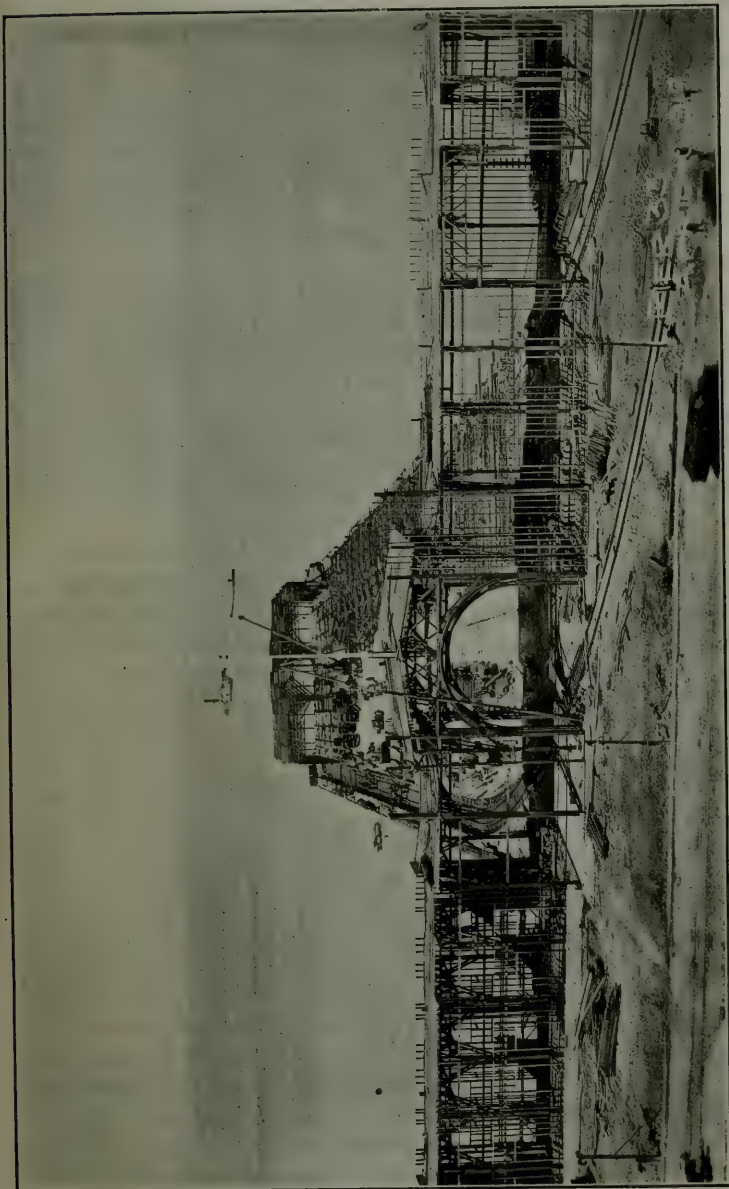
The contract for the shed on Pier 31 included the construction of a building over the bulkhead wharf and connecting wharf between Piers 31 and 29 and across the end of Pier 29. The buildings are timber frame structures; the front facing on The Embarcadero is of cement plaster on metal lath and the other walls are of reinforced concrete. All of the openings are closed with steel rolling doors and the windows are steel sash glazed with wired glass. The buildings were completed in May, 1919.

Pier 33, Shed.

The shed on Pier 33 is of the same construction as that on Pier 31.



Piers 31 and 33 During Construction.



Pier 33—Construction of Shed and Bulkhead Building.

The bulkhead building connects with the one previously constructed in connection with Pier 35, making a continuous front 622 feet in length.

An important feature of the sheds on Piers 31 and 33 and of all sheds of recent construction is the use of a series of separate monitors or pent houses on the center section of the roof, with windows on four sides. This construction permits the entrance of light from every direction, and the result is exceptionally well lighted pier sheds.

The building on Pier 33 was completed in September, 1919.

Pier 41, Bulkhead Building.

In 1918 a shed was built on Pier 41, but it did not cover the inner end of the pier on account of the location of rock bunkers at that point. In May, 1919, these bunkers were moved to the bulkhead wharf between Piers 41 and 43 and the shed on the inner end of Pier 41, and the adjacent bulkhead wharf was constructed. This building has a frontage of 354 feet on The Embarcadero and adds 28,500 square feet of covered space to the pier shed. The length is now 1062 feet and the width 160 feet, making this the largest pier shed on the water front. The shed on Pier 41 was completed in September, 1919.

Post Office Addition.

In order to facilitate the handling of the growing business of the post office an addition was built on the second floor, along the south side of the existing building. This addition is of steel, concrete and brick construction of the same type as the original building. It is 34 feet in width and 104 feet in length, and was completed in February, 1919.

Fish Packing Houses.

Three fish packing houses were erected adjacent to Fishermen's Lagoon for use by companies which operate steam fishing tugs. One of these is a two-story building which is located near the foot of Taylor street. It is 47 feet in width and 100 feet in length, and was constructed of reinforced concrete on a concrete foundation. The first floor contains an office, retail market and packing department and the second floor is used principally for the storage of boxes, gear, etc.

The other two packing houses are located fronting on the westerly extension of the lagoon, between Leavenworth and Hyde streets. They are of timber construction, 50 feet in width, 340 feet in length and one story high. They contain offices and packing departments and store rooms, but no retail markets.

The reinforced concrete building was completed in March, 1919. The

timber building was constructed under two contracts, one of which was completed in June and one in September, 1919.

Boat Shops.

A building which is used for two boat builders' shops was constructed facing Fishermen's Lagoon at Jones street. The building is 80 feet in length by 50 feet in width, and is of frame construction. The boatways from the lagoon are directly in front of the building and the shops are well equipped for building and repairing the boats of the fishing fleet. The building was completed in August, 1919.

Belt Railroad Office.

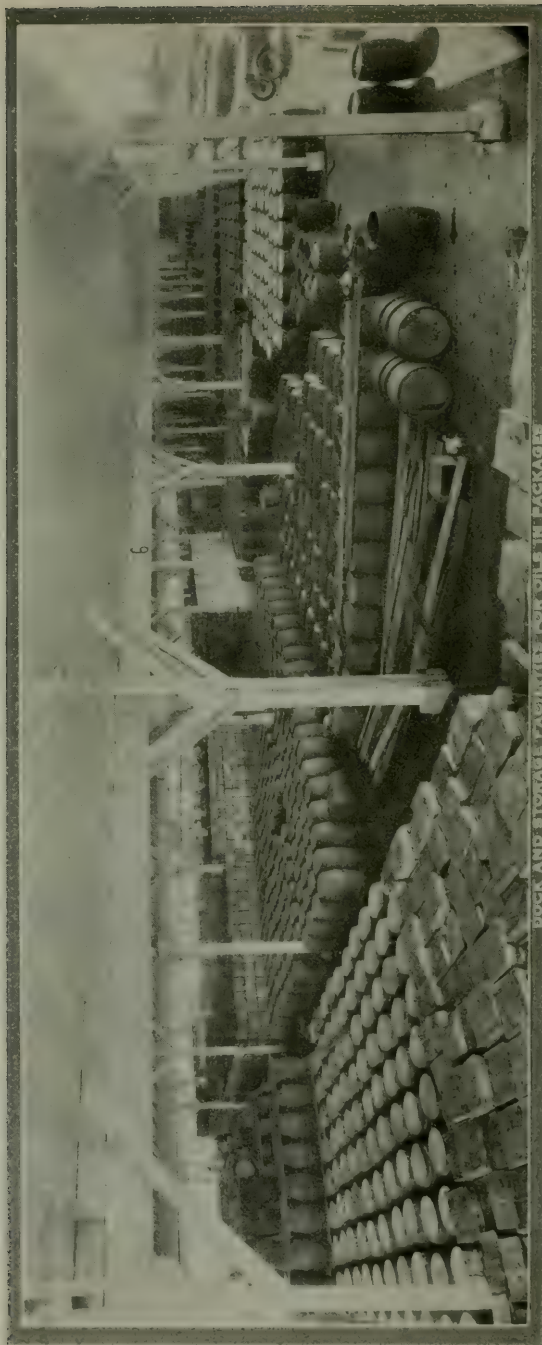
The two-story reinforced concrete office building formerly occupied by the California Transportation Company, near the foot of Washington street, was moved to the bulkhead wharf between Piers 27 and 29 and rearranged for use by the Belt Railroad. The superintendent's office, business office and record room are on the second floor, while the first floor is used for the dispatcher's office and locker rooms for the switching crews. The alterations in this building were completed in December, 1919.

Belt Railroad Oil Tank and Sand House.

On account of the increased fuel oil consumption of the Belt Railroad, as well as for the accommodation of the tugs and dredgers, it was found advisable to provide for additional oil storage. For this purpose an underground tank was constructed adjacent to the round house on Seawall Lot No. 8. This tank is of reinforced concrete, 85 feet in length, 18 feet in width and 6 feet in average depth, having a capacity of 1,116 barrels of oil. Over it was built a reinforced concrete sand house for the storage and drying of locomotive sand. An engine pit was constructed alongside, and a new, large size water column erected so that the lost time of locomotives would be reduced to a minimum by enabling them to take oil, sand and water simultaneously. A 6-inch oil pipe line was laid across The Embarcadero to the wharf between Piers 27 and 29, and is used for filling the tank from oil barges and for furnishing oil to the tugs and dredgers. The oil tank and sand house were completed in January, 1919.

3. OIL TERMINAL.

In order to provide facilities for the efficient and economical handling of the increasing quantities of vegetable oils which are being imported from the Orient, a fully equipped oil terminal was constructed on the property adjacent to the Islais Creek Channel and Third street. The terminal is equipped to receive, store and reship oils arriving in cases, barrels or in bulk.



DOCK AND STORAGE FACILITIES FOR OILS IN PACKAGES

Interior of Shed at Islais Oil Terminal.

The wharf, which has a length along the channel frontage of 750 feet, was reconstructed where necessary and cargo inclines were built to facilitate the unloading of case and barrel oil from lighters. The channel was dredged to a minimum depth of 25 feet at low tide and a minimum width of 250 feet from the Third street bridge to deep water in the bay.

Case and Barrel Oil.

The case and barrel handling section of the plant was designed with the particular idea in mind of conserving leakage. It consists of a concrete floor 180 feet by 400 feet, which is roofed over with an open shed for protection from the weather. The concrete floor was very carefully constructed so as to secure a dense, hard surface. It is laid out in eighteen sections, each sloping to a sump in the center, and by this means all oil which leaks out of defective cases or barrels is reclaimed.

A can cutting and dumping machine having a capacity of 1500 cans per hour was installed. This machine, which is motor driven, cuts the heads of the cans and by means of a chain conveyor slides them along a trough into which the oil drains. At the end of the trough the empty cans are collapsed and baled by hydraulic balers. Two hand dumping tables were also constructed so that different consignments of oil can be dumped at the same time. One table and the machine are equipped with steam coils for use with semiliquid or solid oils. From the machine and the tables the oil drains to sumps, from which it is pumped by rotary pumps to storage tanks or to tank cars for shipment.

For handling barrel shipments a motor driven coopering machine was installed and facilities were also provided for dumping oil from barrels for storage or for bulk shipment.

Bulk Oil.

The bulk oil storage facilities consist of 18 steel tanks located on land set aside for this purpose back of the oil warehouse. The following tanks have been completed and are in use:

2, capacity	970 tons	1940 tons
4, capacity	520 tons	2080 tons
9, capacity	280 tons	2520 tons
1, capacity	75 tons	75 tons
2, capacity	65 tons	130 tons

Total capacity.....6745 tons

The tanks are all equipped with steam coils for heating cocoanut oil and with the necessary connections to the main oil lines. They are arranged in five groups, each enclosed by a reinforced concrete wall. The storage tanks, concrete walls and all piping and pumps inside the walls were provided by five oil importing companies which leased parcels of state-owned land for this purpose.



Can Cutting Machine in Operation at the Islais Vegetable Oil Terminal.



Islais Street Wharf, Showing Barrel Oil Discharged for Terminal.

For handling bulk oil a complete pipe system was installed. This system includes a pipe from the wharf to the storage tanks for handling shipments direct from the steamship, a line with swinging arms for loading tank cars, with connections to the pumps delivering oil from the dumping tables and can dumping machine, and a similar line for loading cars from the storage tanks. The pipe system also includes steam and water pipes for heating the oil and for cleaning tanks, tank cars, oil pipe lines, etc.

A reinforced concrete boiler house was constructed and a boiler installed which furnishes steam for heating, cleaning and pumping.

Railroad tracks having a capacity of 14 cars were constructed adjacent to the case and barrel warehouse and tanks for use in loading tank cars. Box cars of barrel oil are loaded on the wharf track.

Tank Barge.

The tank barge "Mohican," which was purchased for use in transporting bulk oil from ship to oil terminal, was provided with the necessary additional equipment. The original tanks were enlarged so as to increase the capacity from 360 to 650 tons and steam coils were installed for heating the oil. The necessary portable pumps and oil hose were provided for use in pumping out the ship's tanks.

The oil terminal was put in service in April, 1920.

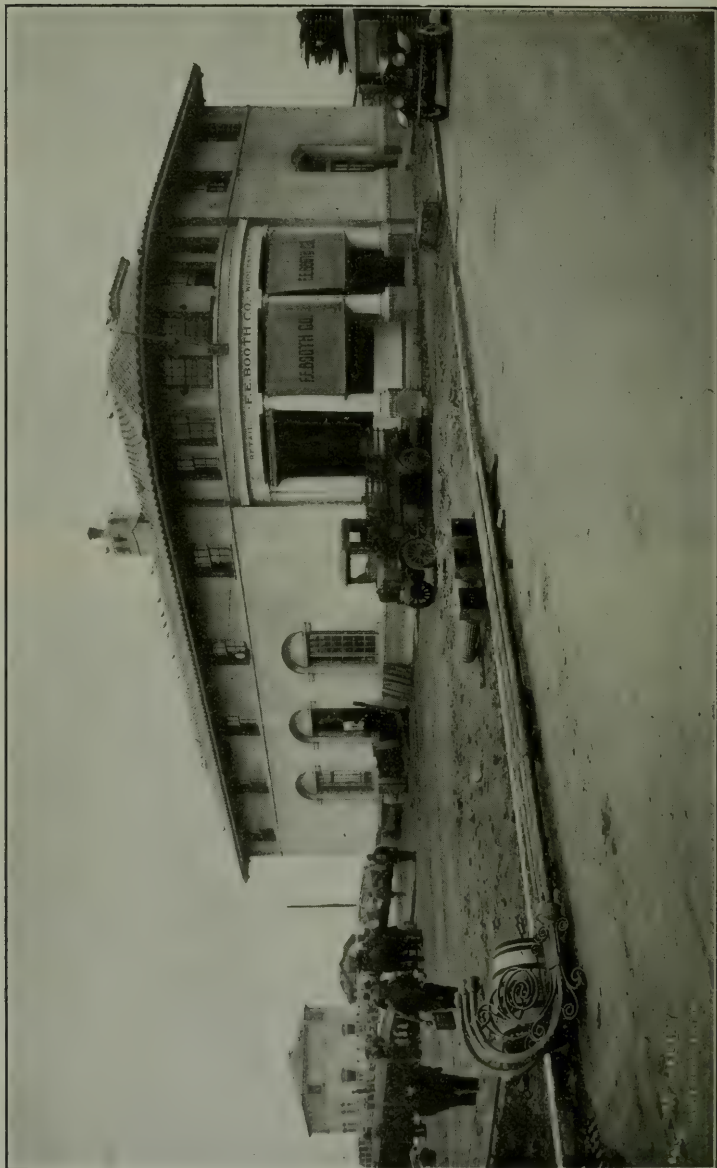
4. MAINTENANCE AND REPAIRS.

The established policy of the Board, that in so far as possible all maintenance, alteration and repair work shall be done by our own organization, has been carried out during the last two years. That this policy is a wise one has, I believe, been definitely demonstrated.

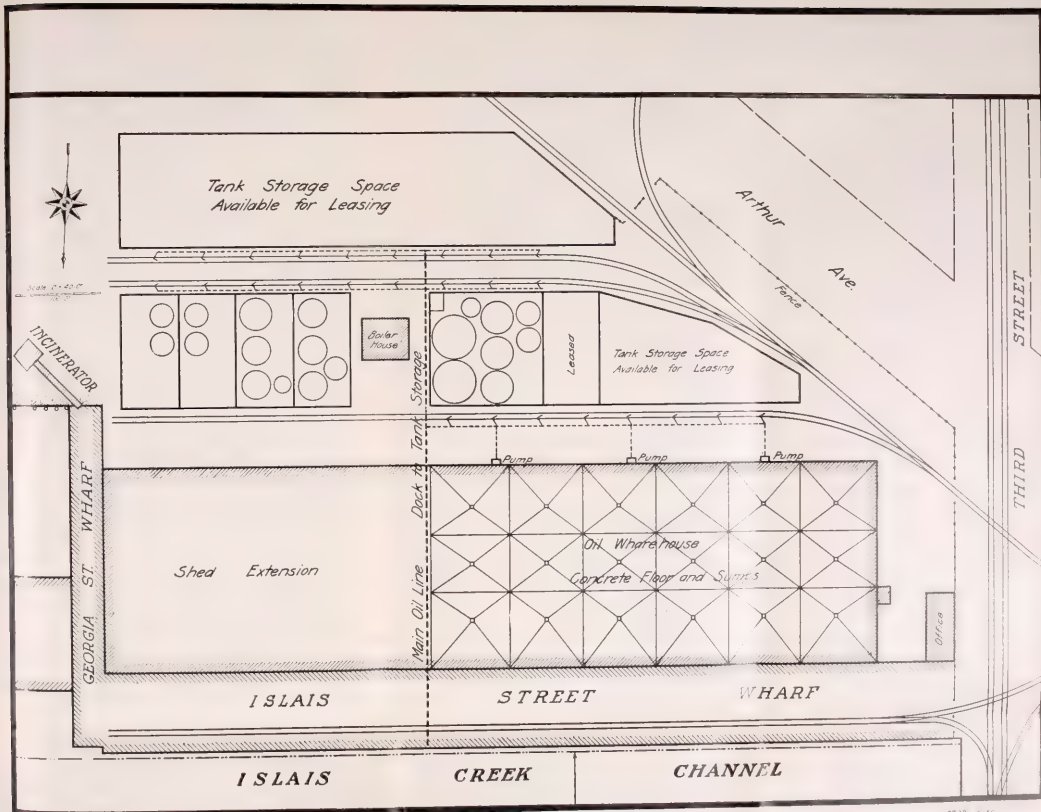
The largest pieces of work undertaken were the extensive repairs to Pier 5 and the tearing out and rebuilding of the dolphin between ferry slips 5 and 6. Both were completed with a minimum of inconvenience to the tenants and at a reasonable cost.

Other items somewhat less extensive were the rebuilding of the track on Pier 27 as a depressed track, the tearing out and reconstructing of wharves at Fishermen's Lagoon, tearing out the old Georgia street wharf and building, with the salvaged materials, a bulkhead for the dredging at Islais Creek. The regular maintenance work was carried on at the same time and the piers, wharves, ferry slips, buildings and street pavement were kept in good condition.

All damages to the various structures were repaired by our organization and numerous small construction jobs were handled for the tenants of the Board. The revenue from these two sources amounted to \$103,817.21 during the last two years.



Leavenworth Street Opened and Paved—Fish Packing House Erected During Biennial Period.



5. BELT RAILROAD.

The most important addition to the Belt Railroad was the construction in conjunction with the Southern Pacific Company of new interchange tracks on the property adjacent to First and Berry streets and The Embarcadero and on The Embarcadero to Brannan street. Additional yard and team tracks were laid on and adjacent to Seawall Lots 17, 18 and 20 and several new industrial spurs were constructed. The additions to the Belt Railroad aggregated 3.45 miles in length, making the total mileage on June 30, 1920, 54.26 miles.

6. PAVING.

As in the past the maintenance of the pavements along the waterfront has been carried on by our own organization. By the construction of several sections of bituminous pavement we have been relieved of considerable maintenance but this has been made up by the extensive Belt Railroad construction and resurfacing in paved streets. During the last two years the contracts for paving The Embarcadero from Washington street to Market street and from Howard street to Folsom street were completed and additional work of the same character was carried out.

Washington Street to Pacific Street.

This section connects those already constructed from Washington street south and from Pacific street north. It consists of bituminous concrete on a 6-inch concrete base and is 915 feet in length. At either end for a total length of 415 feet it is 30 feet in width, but for the remainder of the distance where the seawall is completed the width is 65 feet. Along this portion, also, a 20-foot cement sidewalk was constructed.

Lombard Street to Bay Street.

This section is 1455 feet in length and 40 feet in width. It was laid as an 8-inch concrete pavement with a seal coat of asphalt and screenings. On account of the hardness of the asphalt used and the low temperature of the concrete when the asphalt was applied, a large part of the seal coat cracked and disintegrated. For a considerable time no attempt was made to cover the concrete and it has withstood the abrasion of the traffic remarkably well. As soon as construction joints or low spots began to appear they were covered with asphalt and screenings and experiments were made as to the best materials to use for this purpose.

That information is now available and it is the intention to cover this concrete with another seal coat during the summer. In conjunction with this pavement granite curb was set, drains and catch basins were built and a cement sidewalk 20 feet in width was constructed.

Taylor Street.

As one unit in the improvement of conditions in the vicinity of Fishermen's Lagoon, Taylor street was paved from Jefferson street to The Embarcadero and across The Embarcadero to a point near the waterfront line. This pavement consists of a 6-inch concrete base with a 2-inch Topeka wearing surface. The necessary granite curbs, drains and catch basins were constructed as a part of this contract. The paving of Taylor street was completed in March, 1920.

Jones and Leavenworth Streets.

Two additional outlets from Fishermen's Lagoon were secured by the construction of pavement on Jones and Leavenworth streets. The pavement on Leavenworth street extended from the fish packing houses already described, to Jefferson street where it connected with pavement already constructed. A driveway was paved along Jones street from the Lagoon to Jefferson street and at about the same time two blocks of pavement were constructed by the abutting property owners, extending to Beach and Taylor streets. These two outlets were badly needed as they furnish connections to portions of the waterfront which were practically inaccessible.

7. ELECTRICAL.

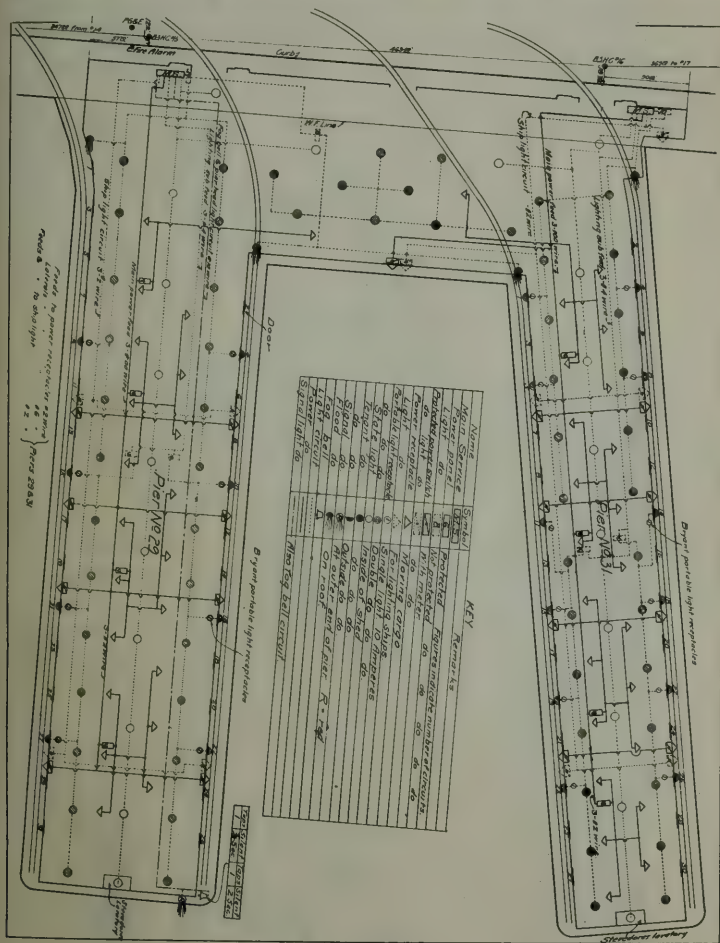
The work of the electrical department during the past two years has been varied and extensive, numerous installations for light and power having been made.

Pursuant to numerous applications from operators for connections which would permit of the installation of cargo handling equipment, a survey was made by electrical engineers representing your Board, the power companies and the manufacturers. This survey was for the purpose of studying the conditions affecting the services to be performed and of deciding upon the most advantageous system from the standpoint of electrical and mechanical efficiency. This investigation resulted in the adoption of three-phase current at a pressure of 220 volts for motive power and single phase or direct current at a pressure of 110 volts for ship lighting.

In order to permit of the use of electric elevators, pilers, stackers and conveyors on the piers and ships and also for lighting on ships, complete systems of wiring were laid out and installed on Piers 21, 25, 29, 31, 33, 41, 30, 32, 36, 38 and 40. Power receptacles are provided inside the sheds and both power and light receptacles outside the sheds for connections to the ships. The latter connections are very useful, especially in connection with ship repairs involving the use of electric welding, boring, drilling or air compressor machinery. All work was of the most modern and permanent type with externally operated safety switches and protective power panels of latest design.

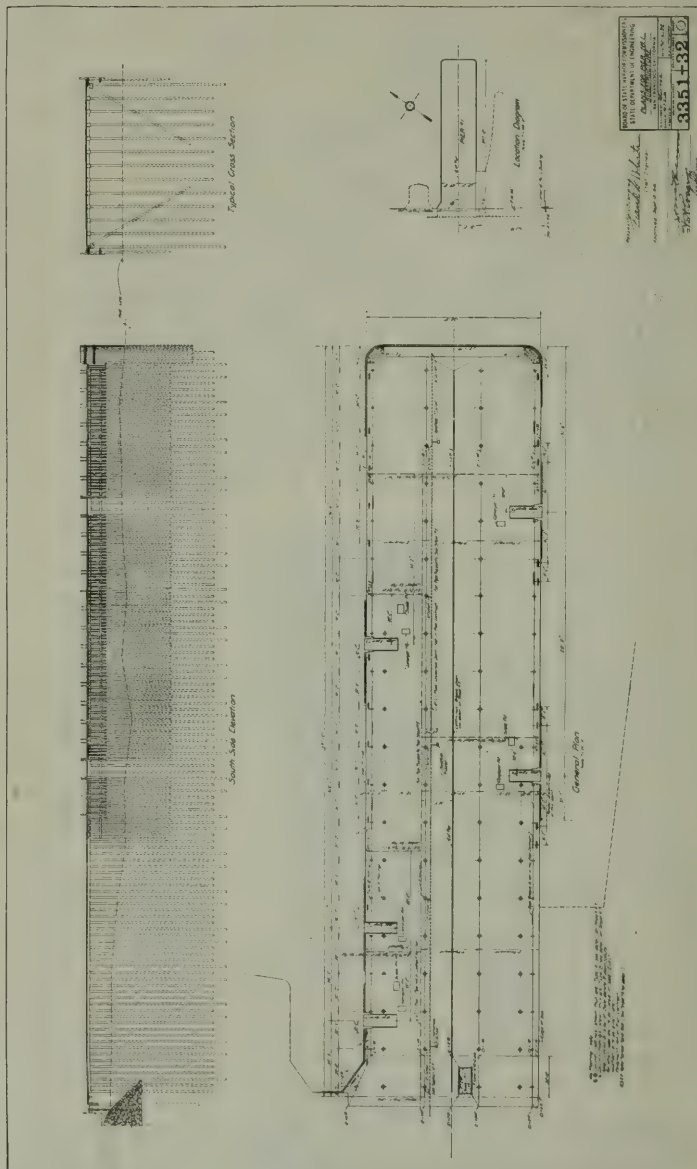
There are at present in use in connection with these installations approximately fifteen pilers and conveyors which were provided by the steamship companies in addition to two electric elevators and two stackers purchased by the Board.

The use of industrial trucks and tractors has also been encouraged and about forty are now in commission on the piers. In this connection



Wiring Plan Piers 29 and 31.

this department has wired for seven battery charging stations at different points with a combined capacity of more than 1500 amperes. We have also purchased for our own use and for renting to the operators, an electric tractor, twelve trailers and two portable motor-generator sets for charging batteries.



Plans for Pier 1.

A complete system of power wiring was installed at the vegetable oil terminal at Islais Creek for the operation of the pumps, can cutters and balers, conveyors and pilers, and cooperage machine. An isolated plant of five k.w. capacity with 50 outlets was installed on the oil barge "Mohican" with double throw switches on the switchboard to permit of taking current from a shore line.

As in the past, all new buildings were wired for light as fast as they were completed. This involved the wiring of Piers 3, 31, 33, additions to Piers 21 and 25, bulkhead building—Pier 41, post office addition, fish packing houses and boat shops at Fishermen's Lagoon, Belt Railroad office and oil terminal. Piers 5 and 40 were also wired for light and Pier 3 was wired to furnish power for operating seven apron conveyors and for ship lighting, receptacles being arranged so that six steamers can receive current at one time.

The underground system was extended to take in Fishermen's Lagoon, the lighting of which is now controlled from the street circuits.

8. DREDGING.

As in the past, the dredging department has taken care of all regular maintenance dredging in the slips as well as several special jobs necessitated by construction work. After the removal of old Pier 1 by the maintenance department the entire area was gone over by the dredger and several hundred submerged pile snags were removed. The same work was done at the site of the dolphin between slips 5 and 6 prior to the construction of the new dolphin.

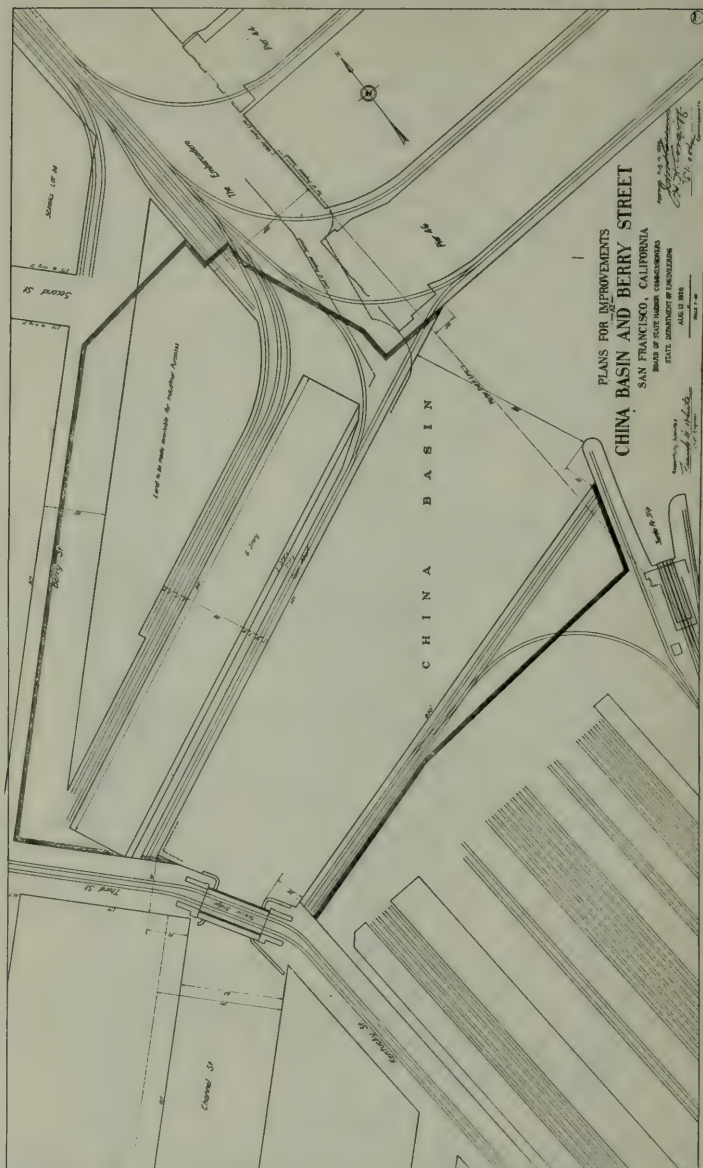
The construction of Piers 31 and 33 necessitated the dredging of the entire space between them and also between Piers 29 and 31 and Piers 33 and 35. As these areas had never been dredged before a large amount of work was necessary to put the slips in usable condition.

On account of the arrival of several large Army transports the slip adjacent to Pier 39 was dredged to a minimum depth of 40 feet at low tide. After this work was completed the "Mt. Vernon," one of the deepest draft vessels afloat, docked alongside this pier without the slightest difficulty.

Up to December 1, 1918, the dredging was carried on with one watch on Dredger No. 2 and two watches on No. 3. On the above date Dredger No. 2 was laid up and the two watches on No. 3 handled the work. On May 20, 1920, a third watch was started on No. 3, but is to be laid off after three months.

9. TESTING.

While the volume of work handled by the testing laboratory during the last two years has not been as large as formerly, the importance



of the work has been no less. Careful supervision has been maintained over the cement as well as other concrete materials, structural and reinforcing steel, paints, oils and all other structural materials. Studies were made of the destructive effect of vegetable oils on concrete and various concrete mixes and protective coatings were investigated with a view to combating this disintegration.

As in the past, tests of various kinds have been carried on for the State Department of Engineering. The testing of cement for all State work, with the exception of the highways, has been handled by the laboratory. Concrete samples have been received and tested in connection with construction work on the Whittier School, Stockton State Hospital, San Jose State Normal School and State Building at the Civic Center in San Francisco.

10. DESIGNING AND DRAFTING.

The work of the drafting room has been carried on by a gradually decreasing number of men owing to the reduction in the construction program. At the same time we have been able to bring up to date some record work which had been previously laid aside on account of construction activities. A new map of the entire waterfront in two sections was completed and is included in this report. A complete set of maps of the Belt Railroad was drawn and is kept constantly up to date. In order to have a complete record of all electrical installations along the waterfront, a set of plats has been started covering the piers and other buildings as well as underground work along The Embarcadero. This work is being carried on as fast as conditions will permit, and at the present time is more than one-half completed.

Numerous studies were made for the development of the Islais Creek-India Basin district and the China Basin district, with a view to having available comprehensive general plans upon which to base the design of specific units when further expansion of the harbor facilities becomes necessary.

Plans for the following work have been completed in addition to those already mentioned.

Pier 1.

Length 597 feet and width 138 feet, reinforced concrete pile construction with a timber frame and concrete shed.

Bulkhead Wharves, Pier 19 and Piers 21 to 25.

Length 745 feet and width 46 feet, reinforced concrete pile construction.

Bulkhead Wharf Building in Front of and Adjacent to Pier 5.

Total length, 313 feet; southerly portion, 164 feet in length by 33 feet in width; northerly portion, 149 feet in length by 49 feet in width, timber frame construction.

Bulkhead Wharf Building in Front of Pier 27 and Between Piers 27 and 25.

Length 318 feet and width 70 feet, timber frame construction.

11. FUTURE DEVELOPMENT.

The practical completion of the improvement of the waterfront between Taylor and Channel streets necessitates the early consideration of the question of the locations to be selected for future development. For many reasons it is evident that conditions are more favorable in the territory extending from Channel street south than along the frontage west of Taylor street.

A number of studies have been made in the past showing the possibilities for the improvement of the waterfront between Channel street and Pier 54, and detail plans have been prepared for a reinforced concrete bulkhead wharf along this entire frontage. Consideration has been taken of the fact that Mission Rock may or may not be acquired by the State and prospective pier locations have been studied with these two alternatives in mind.

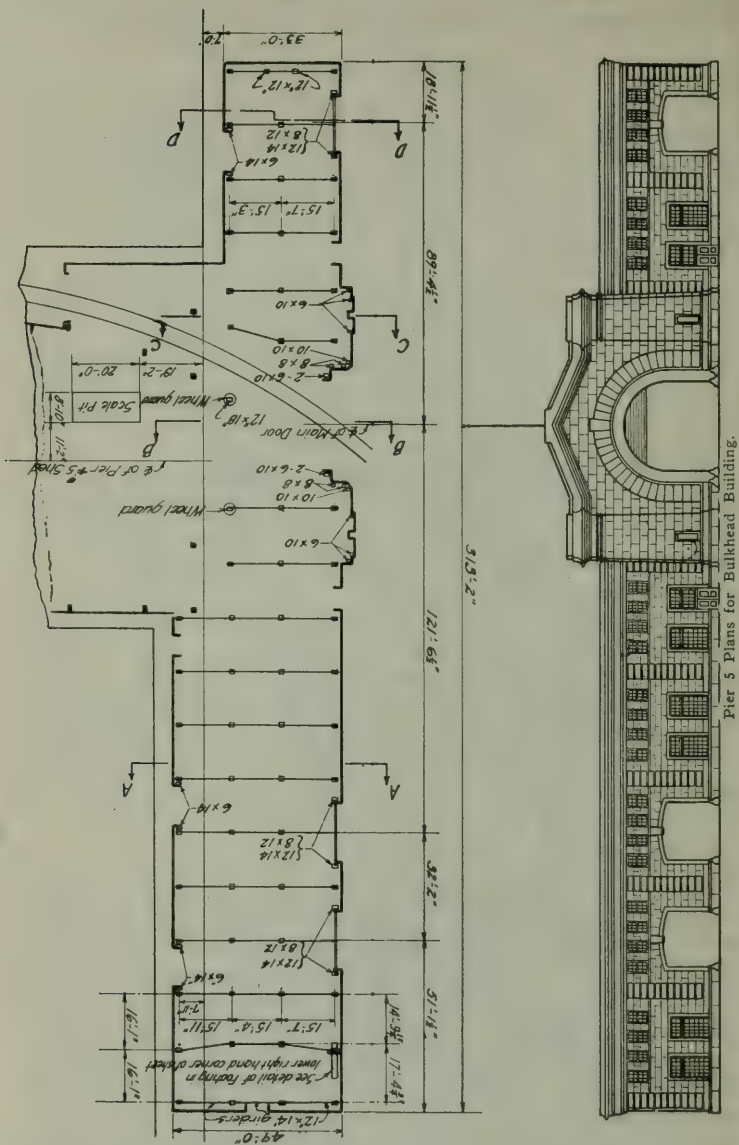
The fact that the Bethlehem Shipbuilding Corporation, the U. S. Steel Products Company and the Western Sugar Refinery, all requiring access to deep water, are located between Central Basin and Islais Creek, renders it inadvisable at this time to proceed with extensive improvements between these points.

There remain for consideration the tracts bounded by The Embarcadero, China Basin, Third street and Berry street and the district bounded by India Basin, Arthur avenue, Islais creek and the waterfront. These two sections are mentioned together on account of their dissimilarity and because of the fact that the former is well adapted to the construction in the near future of a much needed facility while the latter possesses almost unlimited possibilities for progressive future development.

China Basin-Berry Street Improvement.

The improvements proposed at this site, as indicated by the accompanying plans, consist of a seawall extending from Third street near the northerly end of the Channel street bridge to The Embarcadero adjacent to Pier 46 and along The Embarcadero to connect with the existing seawall; the reclamation of the property inside the seawall by filling with dredged material; a reinforced concrete wharf over the outer slope of the seawall from Third street to Pier 46; a combination wharf-shed and warehouse six stories in height facing the wharf; Belt Railroad tracks on the wharf and behind the warehouse and such other tracks as may be necessary to adequately serve the property.

The wharf as planned will be 990 feet in length with a depth of water alongside of 34 feet at low tide. The proposed building will be 816



feet in length, 123 feet in width on the first floor, 110 feet on the second floor and 100 feet on each remaining floor. It is to be served by revolving, semiportal, electric cranes, whip hoists, elevators and other conveying equipment. The combined floor area will be 516,530 square feet. Between the building and Berry street there will be an area of 105,000 square feet of property which will be available for industrial purposes.

The improvement of this tract as outlined will provide facilities which do not now exist, namely, storage space immediately adjacent to a deep water berth, so located as to permit of direct transfer of cargo between ship and warehouse.

The estimated cost of the project as outlined is approximately \$2,300,000.

Islais Creek-India Basin Improvement.

The development of this district, comprising as it does an area of 280 acres of submerged land, constitutes a task which must of necessity extend over a long period of years. The improvement must be progressive and should proceed only as fast as may be justified by the business conditions of the port, both present and prospective.

Plans for the development of such a tract should be more or less elastic, and the one submitted herewith may require modification as to details as the work progresses. It is presented as the result of the preparation and rejection of many studies, and it is believed that it contains all of the elements of a properly coordinated terminal and industrial district.

The plan proposed consists of three major units with several minor units and contemplates the development of the tract east of Arthur avenue and extending from the south side of India Basin to Islais Creek, without regard to the existence of India Basin as such. Each unit consists of a solid fill structure extending practically to the present waterfront line with two projecting piers extending to the pierhead line. The solid fill piers as proposed are 1060 feet in width and vary in length from 1600 to 3000 feet. The piers which extend from these solid fill structures to the pierhead line are 330 feet in width and 1100 feet in length.

Along the edges of the solid fill piers are flush railroad tracks behind which are one or two story wharf sheds. Behind the sheds are depressed tracks and beyond these are warehouses and industrial sites. Down the center is a main highway paralleled by the main railroad tracks which lead to a yard and car ferry slip at the outer end of the filled structure.

The outer piers are separated by a slip 400 feet in width, this width being adopted to permit of easy navigation by large vessels under all

conditions and to afford room for the construction of a ferry slip at the inner end. Each projecting pier has a flush track adjacent to the slips and also depressed tracks in the center between the two separate pier sheds.

The main units are separated by channels 400 feet in width, this being sufficient on account of the angle at the inner end to furnish berths for large vessels. At the head of each main slip a wharfshed and warehouse are provided and the same arrangement is carried out on the south side of the improvement.

In addition to the industrial sites on each main unit, eight blocks suitable for industrial development are created in the southerly portion of the property.

The development shown on the plan submitted will provide berths for 49 steamships each 500 feet in length and 6 berths for vessels 300 feet in length. The sheds are planned to be of ample width so that the cargo of each vessel can be accommodated in the space behind its own berth. The area available for warehouse and industrial sites will amount to 73 acres, all close to deep water and served by railroad tracks.

12. RECOMMENDATIONS.

In addition to the regular maintenance and repair work and small routine construction jobs with which we are continually confronted, there are several items in the program for improving the waterfront which, in my opinion, should be carried out or at least be begun during the next two years. I therefore respectfully recommend that consideration be given to the desirability of carrying forward the following work as fast as the available resources warrant:

1. China Basin-Berry Street Improvement.

This is a type of facility not now available but for which there is a constant demand. The complete development will extend over a considerable period of time and the preliminary work such as wrecking the old structures and dredging the site should be begun as soon as possible.

2. Bulkhead Wharves—Pier 19 to Pier 25.

The existing wharves at this location are in a very unstable condition and should be replaced with reinforced concrete structures in order to avoid heavy maintenance expense. Plans for this work have been prepared and approved.

3. Bulkhead Building and Shed Front—Pier 5.

This building would be used by the river transportation companies at present tenants on Pier 5 and by smaller lines operating to near by bay and river points.

4. Bulkhead Building and Shed Front—Pier 9.

This is a building similar to the one proposed at Pier 5 and would be used in the same way. The substructures at Pier 5 and Pier 9 are already completed.

5. Paving.

The smooth pavement on The Embarcadero is continuous from Market street to Powell street with the exception of the portion from Pier 19 to Pier 27. South of Market street the smooth pavement extends as far as Folsom street. By paving from Pier 19 to Pier 27 and from Folsom to Harrison streets and by using the existing bulkhead wharf south of Harrison street, it would be possible to operate an auto bus line between Powell and Channel streets. As the city officials at one time agreed to operate such a bus line upon the completion of the smooth pavement, and as comparatively little remains to be done, it would be advisable to complete the work in the near future.

6. Islais Creek-India Basin Development.

The possibilities in this district are enormous and, as has been said, it should be carried on progressively. The work involved in the construction of any one unit is so large and will cover such a long period of time that a start should be made in order to have available space for expansion when the need arises. The walls on each side of the first solid fill pier should be pushed out into the bay and the space between them filled as material is available. Other features of the development could then follow in accordance with the demands of shipping and industry.

In conclusion, I desire to express my appreciation of the support accorded to me by the Board in connection with the work of the past two years and also to commend the faithful cooperation of all employees of the department.

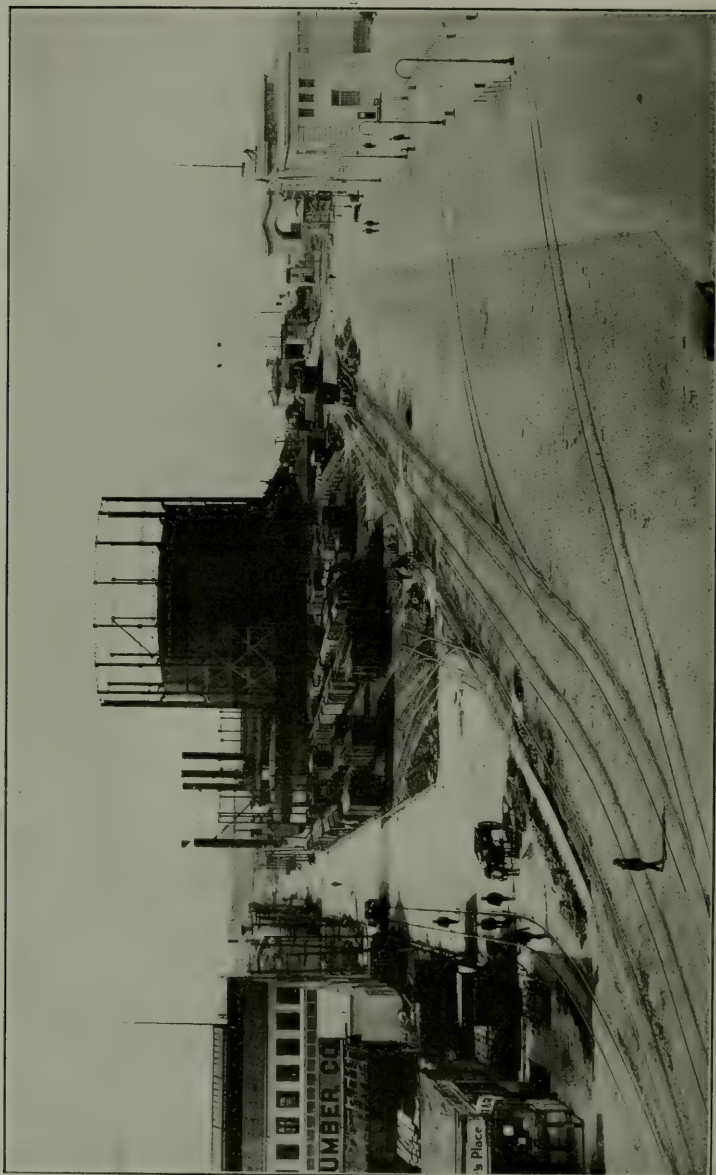
Respectfully submitted.

FRANK G. WHITE,
Chief Engineer.



PART III.

**REPORT OF SUPERINTENDENT OF THE
BELT RAILROAD.**



Belt Railroad Storage Yard.

REPORT OF SUPERINTENDENT OF THE BELT RAILROAD.

SAN FRANCISCO, July 1, 1920.

*To the Honorable Board of State Harbor Commissioners,
San Francisco, California.*

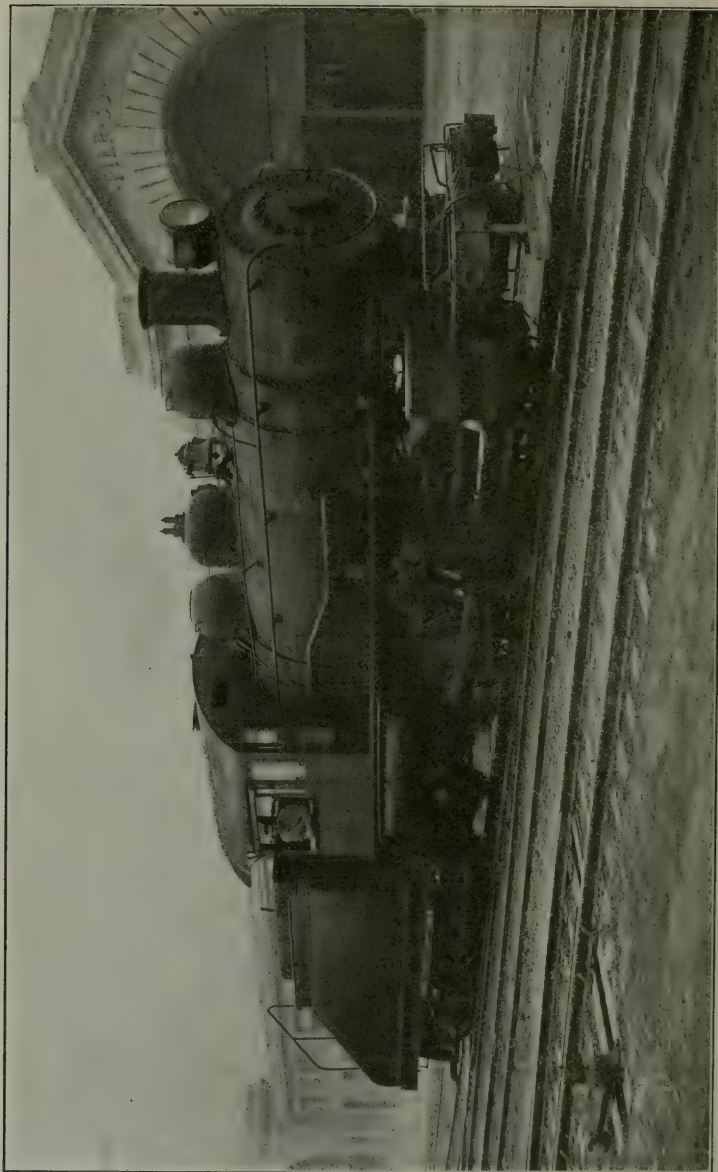
GENTLEMEN: I herewith submit biennial report of the operation of the Belt Railroad for the period beginning July 1, 1918, and ending June 30, 1920.

Operation.

The Belt Railroad is a terminal switching railroad, owned by the State of California, and operated and controlled by the Board of State Harbor Commissioners. Operated continuously 24 hours daily, every facility is furnished for the prompt movement of freight to and from the steamships calling at this port, as well as to the warehouses and commercial interests located here. Cars are transferred from railroad to railroad; from railroads to industries, piers, team tracks, and vice versa. As of December 31, 1919, the mileage of the Belt Railroad included 8.01 miles of main line and 17.95 miles of yard tracks owned and operated and 11.26 miles of private spurs and railroad terminal tracks. According to variation of business throughout the year, nine to sixteen crews are employed; three shifts daily. During the period subsequent to the closing of the war in the fall of 1918 a great deal of shipping was diverted from San Francisco to eastern ports, the consequent falling off in traffic necessitating reduction of crews. A year later, however, the resumption of shipments brought business again to normal, and receipts in October and November, 1919, were equivalent to those of pre-war times. A comparison of car movements for the calendar years 1916-1917-1918 and 1919 follows:

Year	Loaded cars moved	Empty cars moved	Total
1916 -----	124,020	54,396	178,416
1917 -----	128,912	55,122	184,034
1918 -----	117,804	49,966	167,770
1919 -----	110,251	42,969	153,220

Under the present system of operation, the Belt Railroad gives exceptionally prompt service, as compared with other terminal systems, which is performed as often as required by patrons, and not limited to one or two switches daily, as is customary in the various other railroad terminals. The trunk railroads (Southern Pacific Company, Western Pacific Railroad Company, Atchison, Topeka and Santa Fe Railway



Belt Line Engine No. 9.

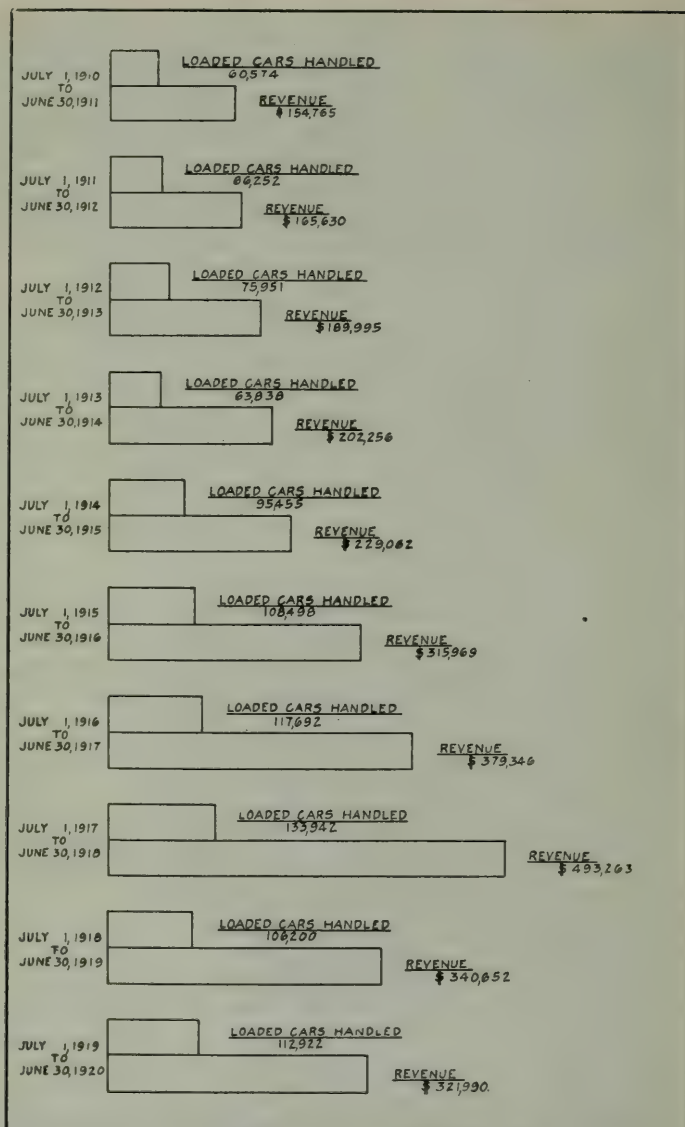
Company, Northwestern Pacific Railroad Company furnish prompt service at the various interchanges, inbound and outbound, each of the railroads maintaining car ferry barges, and in this manner cars are dispatched with a minimum of delay. All cars arriving at San Francisco, Oakland, or other railroad terminals, for points on the Belt Railroad, are blocked together, and in drags, and via car ferry barges, are forwarded promptly to Belt interchange tracks. The Belt Railroad maintains a direct interchange with the Southern Pacific Company and in addition there are three standard ferry slips for the use of barges.

The Belt Railroad is amply provided with track storage facilities. At the present time there is a storage space for approximately 1000 cars on Belt tracks, and in addition 600 cars can be stored in the various railroad yards served by the Belt Railroad. This is sufficient to take care of present and prospective needs. The actual track facilities alongside the piers served by the Belt Railroad will accommodate 700 cars at one setting, and from three to five switches a day could readily be made. Adequate facilities are provided for the team delivery of freight, and these tracks are situated at such points as afford every convenience to shippers using same.

In my last biennial report to your Board I recommended the purchase of two standard 6-wheel switching locomotives, in order to meet the demands of our rapidly-increasing business. The difficulty of securing new equipment resulted in postponement of action on this recommendation until the present year, when a locomotive of our standard type was ordered. Delivery of this engine was made on June 23, giving us five heavy locomotives suited to the traffic now moving over our rails and three engines of a smaller and lighter type.

The purchase of a locomotive crane of 15 tons capacity early in the year 1919 has afforded shipping and commercial industries on the waterfront great convenience in the transfer of heavy machinery, rails, etc. This effects a material economy to offshore shipping, to which the element of time is all important. Continual calls for the crane on piers and bulkheads demonstrates its value, while it has also proved useful to the United States Government in transferring heavy artillery. The revenue earned by this hoist to date, approximately \$2,400, covers maintenance and repairs, with an ample margin to eventually defray its original cost.

Maintenance and repair of Belt Railroad motive power has been handled efficiently by the machine shop and roundhouse force, at a cost comparing most favorably with the expense of other switching roads. The machinery and facilities we have are equal to any emerg-



COMPARATIVE DIAGRAM SHOWING REVENUE AND NUMBER
LOADED CARS HANDLED ON BELT RAILROAD SINCE JULY 1, 1910

ency, although we have to rely upon outside shops for the turning of our locomotive driving wheels.

The new Belt Railroad office building, located on the bulkhead between Piers 27 and 29, was occupied September 27, 1919. Ample accommodations are provided for the Superintendent and clerical staff, while the record room and filing systems for classifying records render all data instantly available. Office equipment of the approved modern pattern is installed, and the conveniences provided for the yardmasters and switching force are decidedly in advance of similar institutions elsewhere. The permanent character of the building, amply lighted, heated and ventilated; the locker-rooms, shower baths for switchmen's use, and other advantages, contribute to the maintenance of a permanent working force.

Since the Belt Railroad track across the front of the Ferry Building was completed in 1913 occasional complaints have been made regarding the interruption of pedestrian traffic by passing trains. The situation was not completely remedied until 1919, when the present Board of Harbor Commissioners constructed and opened to traffic an overhead passenger viaduct, spanning the Belt track and streetcar loops. The traveling public can thus have access to the ferries without annoying delays, while the danger of grade crossings is eliminated.

Financially, the balance sheet of the Belt Railroad during the biennial period just closed suffers somewhat from the reduction in switching charges running up to April 15, 1920. A slight advance in the tariff was then made, on the basis of \$3 per car. This switching charge, while making the Belt Railroad self-sustaining, affords no safe margin for development, and is an inadequate return for the service rendered. There are few railroads in this country furnishing switching facilities at such a low cost, and certainly none giving so long a haul as does the Belt Railroad, where a car movement of over four miles for a single switching charge is not uncommon. Many of the terminal systems base their tariffs on the commodity transported, while others have established a sliding scale on the zone plan, the cost to patrons varying with the distance cars are moved. The Belt Railroad on the other hand, takes no cognizance of contents of cars, maintaining a uniform tariff rate, irrespective of the length of haul.

Construction.

Belt Railroad trackage has been maintained and improved by our section force. Replacement of the old type of T-rail by heavier steel of girder pattern admits of the safe movement of longer trains, and tends to eliminate the liability of accident through derailments.

Since July 1, 1918, new tracks have been laid on Piers 3, 5, 27, 31 and 33, while those on Piers 21 and 43 are extended to afford greater

facilities to shipping. At Islais Creek extensive improvements are in progress, much additional trackage being now in operation at the industries located there. The rice mills and oil storage plants have every convenience for receiving and dispatching raw materials and finished products.

Owing to the increased yard room and trackage now in operation the Belt Railroad has ample facilities for efficient handling of its present local and export traffic. New storage tracks on block 18 accommodate a great number of cars, affording storage space and team trackage and permitting prompt delivery of freight to industries and piers in that locality. The yard recently completed at King street and The Embarcadero effectually eliminates delays in distributing cars, four transfer tracks being provided for interchange of traffic between the Belt Railroad and the Southern Pacific Company. Two of these transfer tracks are allotted to the delivery of inbound cars, outbound cars being placed on the remaining tracks for removal by the Southern Pacific Company whenever required.

Recommendations.

I have submitted to your Board my recommendations for adding to our machine shop equipment a 48-inch boring mill and a planer, 3 ft. 6 in. by 12 ft. With this machinery we can effect an economy of twenty per cent in time and labor, while our motive power can be restored to service more promptly than is now possible.

There is a constant demand from our patrons for cars to transport machinery, scrap iron and other commodities from warehouse to pier, besides other point-to-point movements on the Belt Railroad. The few wooden flatcars now in use cannot fill these requirements, and I have advised the addition of four boxcars and four gondolas of standard type. The capital investment in this rolling stock would be amply returned by the revenue received from rental and switching charges.

Respectfully submitted.

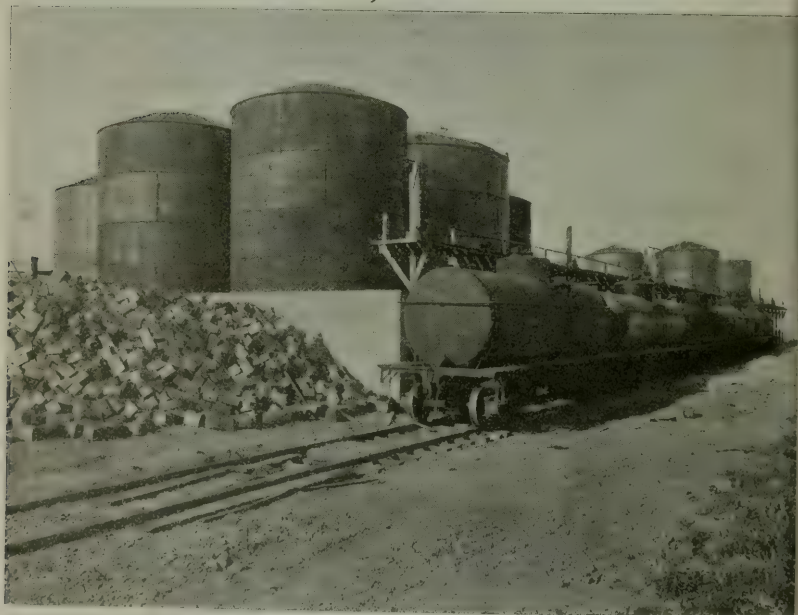
FRED E. STEWART,
Superintendent.

PART IV.

REPORT OF ATTORNEY.



Islais Creek Oil Terminal—Vegetable Oils may be loaded Directly from Tank to Car and from Ship to Tank.



These Tanks Are Erected on Land Leased to Private Firms and Operated by the Board.

REPORT OF ATTORNEY.

*To the Honorable Board of
State Harbor Commissioners.*

GENTLEMEN: My report from July 1, 1918, to July 1, 1920, is as follows:

I have drawn for the Board twenty-seven contracts which were executed and carried out, involving the sum of \$616,266.39. This, however, does not include sums paid for oil, lumber, street cleaning and electric light and power.

The following is the history of litigation during the period mentioned:

1. *People of the State of California ex rel. Board of State Harbor Commissioners, vs. Gray Brothers Crushed Rock Company and the Aetna Indemnity Company of Hartford, Connecticut.* On the second day of June, 1919, I collected from the receiver of the Aetna Indemnity Company of Hartford, Connecticut, the sum of \$12,439.07.

2. *Henry Cowell Lime and Cement Company vs. State of California and Members of the Board of State Harbor Commissioners.* This is an action involving a portion of land claimed by the Board as the westerly line of The Embarcadero and by the plaintiff as the easterly line of its property. The action is pending before Judge Murasky.

3. *People of the State of California ex rel. Board of State Harbor Commissioners vs. Southern Pacific Company and one hundred forty-four other defendants.* Being owners of individual parcels of land constituting property north of Islais Basin and extending to Islais Creek. This was an action in eminent domain to condemn for the state sixty-three blocks of land bound by Islais Channel, Waterfront street, India street and Arthur avenue. Upon rendering of my last report 3,492,162 square feet had been acquired. Since then the balance, or 1,012,323 square feet have been acquired; the award for the last number of square feet being the sum of \$300,952.03. All the property directed to be acquired by the state by act approved March 24, 1909, has now been acquired and is being operated by the Board for the commerce of the port.

4. *Leslie Decot vs. J. H. McCallum, Harry H. Cosgriff and Miles Standish as members of and constituting the Board of State Harbor Commissioners of the State of California.* Mandamus proceedings to compel the Board of State Harbor Commissioners to pay certain dredgersmen for certain holidays upon which they did not work; the

Board contending that those particular holidays were expressly excluded from those designated by the dredgersmen as nonworking holidays. Case is pending.

5. *John W. Sweeney vs. David J. Reese, Edgar Williams and Charles Wesley Reed, as members of and constituting the State Civil Service Commission of California.* Petition for writ of prohibition restraining the Civil Service Commission from trying John W. Sweeney, a wharfinger, upon charges preferred by the Board. Writ denied by the superior court and proceedings ordered dismissed.

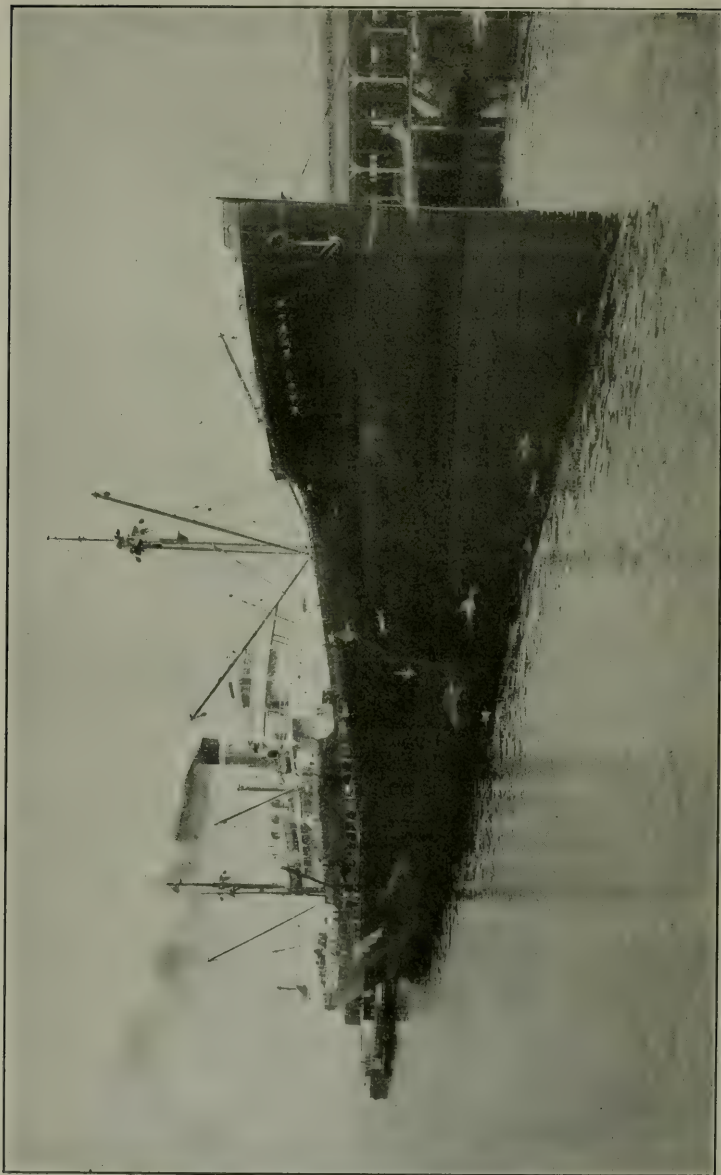
I have also drawn five leases of lands in Islais Creek district for vegetable oil stations pursuant to the right granted to the Board to make such leases by act of the Legislature approved April 30, 1919.

Respectfully submitted.

DANIEL A. RYAN,
Attorney.

PART V

REPORT OF SECRETARY.



Vessel Discharging Oil Into Tank Barge "Mohican" and at Islais Oil Plant Simultaneously.

REPORT OF SECRETARY.

SAN FRANCISCO, September 1, 1920.

*To the Honorable the Board of
State Harbor Commissioners.*

GENTLEMEN: I herewith submit my report for the biennial period from July 1, 1918 to June 30, 1920, consisting principally of financial statements as prepared by the Accounting Department. The statements comprise the following:

Exhibit "A"—Comparative balance sheet as of June 30, 1920 and June 30, 1919.

Schedule 1—Fort Mason Tunnel account.

Schedule 2—Analysis of property and equipment showing comparative value of real estate, piers, wharves, buildings, equipment, etc.

Exhibit "B"—Comparative statement of revenue and expense as of June 30, 1919 and June 30, 1920.

Schedule 1—Comparative statement of operating revenue and expense.

Schedule 2—Analysis of expense of operation.

Schedule 3—Analysis of expense of operation.

Schedule 4—Comparative statement of revenue and expense of Belt Railroad as of June 30, 1919 and June 30, 1920.

The accounts are self-explanatory, but the following brief resume might be of interest:

Exhibit "A" shows, in comparative form, the financial condition of the Board of State Harbor Commissioners as of June 30, 1919 and June 30, 1920.

Schedule 1 of Exhibit "A," Fort Mason Tunnel account, shows that there has been realized toward the payment of the cost of tunnel, between the date of acceptance October 22, 1914 and June 30, 1920, \$65,245.28, of which \$39,969.91 has been realized during the biennial period.

Schedule 2 is an analysis or inventory of property and equipment under the jurisdiction of the Board of State Harbor Commissioners as of June 30, 1919 and June 30, 1920, showing comparative values of real estate, piers, wharves, buildings, equipment, etc., in a sum total of \$22,399,649.10. These figures show the actual cost to the Board of property inventoried and do not include the appraised value of seawall

lots, etc., of \$5,530,743.50 and 50 acres in China Basin and Central Basin properties leased to the Atchison, Topeka and Santa Fe Railway Company of \$1,900,000.

Exhibit "B" gives in comparative form the revenue and expense by years and shows a net revenue on June 30, 1919 of \$583,480.48 and on June 30, 1920—\$597,822.23.

In accordance with the Board's policy of making all improvements out of current revenue, this surplus, plus the surplus remaining from the San Francisco Harbor Improvement Fund from the preceding period has all been expended for permanent improvements and equipment, a detailed list of which expenditures, totaling the sum of \$1,282,618.96, is shown in the auxiliary statement marked "Detail of property acquired from revenue fund—fiscal years 1918, 1919, 1920."

Schedules 1, 2 and 3 of Exhibit "B" show in detail analyses of revenue from operation and the cost of operation during the two-year period.

Schedule 4, Exhibit "B" is an analysis in detail of the revenue and expense of the Belt Railroad and shows number of switches, revenue per switch, operation, etc.

In addition to the above there is also presented a compilation, prepared in this office during the past year, of exports and imports passing through the port of San Francisco. This is presented for publication in the biennial report under "Matters of general information."

In conclusion I desire to acknowledge the cooperation and efficient service of all employees of the Secretary's office during the past two years of my secretaryship and more particularly that of Mr. Louis T. Diebels, Chief Accountant.

Respectfully submitted.

HILDA GOHRMAN,
Secretary.

PART VI.

FINANCIAL STATISTICS.

BOARD OF STATE HARBOR
COMPARATIVE BALANCE SHEET AS OF

REVENUE

	June 30, 1920		June 30, 1919	
OPERATING ASSETS				
San Francisco Harbor Improvement Fund		\$189,638 11		\$285,049 81
With State Treasurer-----	\$35,563 03		\$100,197 52	
With Anglo & London Paris Nat. Bank	151,102 08		181,852 29	
Office Revolving Fund-----	3,000 00		3,000 00	
Accounts receivable -----	\$161,921 82	144,127 68	\$214,879 07	197,084 93
Less reserve for doubtful accounts----	17,794 14		17,794 14	
Fort Mason Tunnel Account-----		207,904 10		219,927 71
Inventories -----		189,557 02		212,433 79
Materials and supplies-----	\$188,747 78		\$238,168 53	
Work in process-----	800 24		4,265 26	
Deferred charges -----		26,623 80		27,854 65
Prepaid fire insurance-----	\$19,436 87		\$16,893 67	
Undistributed expense -----	7,186 93		10,987 98	
Totals -----		\$757,880 71		\$972,350 80

CURRENT BOND

Bond Issue Funds		\$2,350 89		\$121,171 34
Second San Francisco Seawall Fund	\$1,000 00		\$1,000 00	
Third San Francisco Seawall Fund	899 61		41,603 14	
India Basin Fund	451 28		78,568 20	
Sinking Funds		\$307,792 08		\$306,707 12
For bond maturities	\$61,432 06		\$30,307 12	
For bond interest maturities	246,360 00		245,400 00	
Totals		\$310,142 97		\$428,878 46

PROPERTY

Property and equipment		\$22,399,649 10		\$21,416,273 24
Balance beginning of fiscal period	\$21,416,273 24		\$20,276,304 64	
Property acquisitions, current years:				
From revenue accounts	771,292 64		602,920 95	
From bond accounts	245,052 18		595,672 32	
	\$22,432,618 06		\$21,474,897 91	
Less current year losses	32,968 96		58,624 67	
Totals		\$22,399,649 10		\$21,416,273 24

TRUST

Trust cash		\$1,275 02		\$524 25
Guarantee deposits	\$635 25		\$524 25	
U. S. Government War Tax deposits	639 77			
Trust accounts receivable		\$26 74		
U. S. Government War Tax charges uncollected	\$826 74			
Totals		\$2,101 76		\$524 25

COMMISSIONERS

EXHIBIT A.

JUNE 30, 1920 AND JUNE 30, 1919.

ACCOUNTS

	June 30, 1920		June 30, 1919	
OPERATING LIABILITIES				
Accounts payable -----		\$112,843 70		\$117,882 01
S. F. Harbor Improvement Fund claims	\$112,843 70		\$117,882 01	
Deferred credits to revenue -----		237,704 99		299,512 47
Unearned prepaid rents -----	\$237,704 99		\$299,512 47	
Revenue surplus		377,332 02		554,956 41
Balance beginning of fiscal period -----	\$554,956 41		\$574,393 88	
Less adjustment of prior revenue -----	4,153 98			
	\$550,802 43			
Current revenue surplus, Exhibit B. ---	597,822 23		583,480 48	
	\$1,148,624 66		\$1,157,877 36	
Less expended for properties and equip- ment -----	771,292 64		602,920 95	
Totals -----		\$757,880 71		\$972,350 89

ACCOUNTS

Accounts payable from bond funds -----		\$1,000 00		\$37,768 27
Second S. F. Seawall Fund claims -----	\$1,000 00		\$1,000 00	
Third S. F. Seawall Fund claims -----			36,768 27	
Sinking Fund liabilities -----		307,792 08		305,707 12
Matured bonds -----	\$31,432 08		\$30,307 12	
Matured bond interest -----	246 360 00		245,400 00	
Current bond funds surplus		1,350 89		83,403 67
Balance beginning of fiscal period -----	\$83,403 07		\$29,075 39	
Bonds sold during period -----	163,000 00		650,000 00	
	\$246,403 07		\$679,075 39	
Less expended for properties and equip- ment -----	245,052 18		595,672 32	
Totals -----		\$310,142 97		\$426,878 46

ACCOUNTS

Bonded indebtedness -----		\$12,256,537 92		\$12,209,692 88
San Francisco Seawall Bonds outstand- ing, unmatured -----	\$403,567 92		\$519,692 88	
Second S. F. Seawall Bonds outstanding	9,000,000 00		9,000,000 00	
Third S. F. Seawall Bonds outstanding	2,000,000 00		2,000,000 00	
India Basin Bonds outstanding -----	853,000 00		600,000 00	
Reserve for depreciation of properties. ---		300,000 00		
Property surplus -----		9,843,061 18		9,206,580 36
Totals -----		\$22,399,649 10		\$21,416,273 24

ACCOUNTS

Trust liabilities -----		\$2,101 76		\$524 25
Special deposits -----	\$635 25		\$524 25	
U. S. Government War Tax charges -----	1,466 51			
Totals -----		\$2,101 76		\$524 25

FORT MASON TUNNEL ACCOUNT—EXHIBIT A. SCHEDULE 1.

Analysis of account showing liquidation to June 30, 1920, of the cost of that section of the Fort Mason Tunnel within the confines of the Fort Mason Military Reservation in accordance with the agreement between the Board of State Harbor Commissioners and the United States Government.

EXCERPTS FROM AGREEMENT REFERRED TO:

Section 3. "That all freight of the United States, or freight originating or incident to any portion of the region to the east or west of Fort Mason passing through the tunnel shall pay, in addition to an equitable track and switching charge, a tunnel charge of \$10.00 per car."

Section 5. "All tunnel charges shall be applied toward paying the cost of the work * * * including interest at 5 per cent per annum, and as soon as that sum has been paid said charges will cease and thereafter there shall be no further tunnel charges. If unforeseen or unusual conditions or accidents shall at any time make a further charge necessary or equitable it shall be governed by additional regulations of the Secretary of War."

	Cost	Interest charges	Tunnel toll credits	Balance
Cost of that section of the tunnel within the confines of the Fort Mason Military Reservation—per Chief Engineer's figures at date of acceptance, October 22, 1914 -----	\$273,149 38			
June 30, 1915 -----		\$9,446 42	\$8,500 00	\$274,095 80
June 30, 1916 -----		13,704 79	18,155 00	239,645 59
June 30, 1917 -----		13,482 28	14,705 00	263,422 87
June 30, 1918 -----		13,421 14	33,970 00	247,874 01
June 30, 1919 -----		12,393 70	40,340 00	219,927 71
June 30, 1920 -----		10,996 39	23,020 00	207,904 10
Totals -----	\$273,149 38	\$73,444 72	\$138,630 00	\$207,904 10

BOARD OF STATE HARBOR COMMISSIONERS—EXHIBIT A. SCHEDULE 2.

Analysis of property and equipment as of June 30, 1920 and June 30, 1919, showing comparative values of real estate, piers, wharves, buildings, equipment, etc.

	Balance June 30, 1920	Balance June 30, 1919
Real estate purchased—		
Embarcadero, foot of Harrison street.....	\$25,000 00	\$25,000 00
India Basin	852,548 72	611,431 80
Total real estate.....	\$877,548 72	\$636,431 80
Seawall lots—		
Seawall Lot C—cost of filling.....	\$7,732 93	\$7,732 93
Seawall Lot 21—cost of filling.....	891 22	891 22
Total seawall lots.....	\$8,624 15	\$8,624 15
Piers and wharves—		
Fishermen's wharves and basin.....	\$110,280 11	\$86,854 75
Pier No. 43.....	107,078 43	63,788 57
Pier No. 41.....	402,560 84	334,853 53
Pier No. 39.....	561,003 25	561,005 25
Pier No. 37.....	397,047 96	397,047 96
Pier No. 35.....	637,052 22	637,052 22
Pier No. 33.....	579,527 07	500,348 67
Pier No. 31.....	610,303 53	580,200 67
Pier No. 29.....	542,831 93	535,275 59
Pier No. 27.....	279,124 70	238,396 53
Pier No. 25.....	231,646 75	138,909 51
Pier No. 23.....	91,014 52	90,714 59
Pier No. 21.....	181,056 98	178,832 72
Pier No. 19.....	84,549 37	82,791 42
Pier No. 17.....	303,351 56	303,374 56
Pier No. 15.....	168,145 77	168,145 77
Pier No. 11.....	216,111 52	216,111 52
Pier No. 9.....	87,844 31	87,844 31
Pier No. 7.....	195,075 92	187,175 63
Pier No. 5.....	106,759 41	60,754 10
Pier No. 3.....	491,562 04	489,960 26
Pier No. 1.....	13,190 63	12,306 99
Pier No. 14.....	78,538 97	78,538 97
Pier No. 16.....	244,834 36	244,834 36
Pier No. 18.....	249,879 25	249,879 25
Pier No. 20.....	115,095 49	104,951 50
Pier No. 22.....	119,835 47	119,835 47
Pier No. 24.....	226,631 64	226,631 64
Pier No. 26.....	680,019 77	630,019 77
Pier No. 28.....	451,020 54	451,020 54
Piers Nos. 30 and 32.....	1,271,903 43	1,267,257 86
Pier No. 34.....	168,055 91	168,055 91
Pier No. 36.....	416,323 37	414,562 11
Pier No. 38.....	362,474 76	353,891 98
Pier No. 40.....	368,884 87	363,818 30
Pier No. 42.....	292,333 20	292,034 07
Pier No. 44.....	218,946 98	218,946 98
Pier No. 46.....	334,235 43	334,078 91
Second Street Wharf.....	6,997 00	6,997 00
Berry Street Wharf.....	45,934 72	45,934 72
Third Street Wharf.....	28,369 00	28,369 00
Channel Street wharves.....	33,000 00	33,000 00
China Basin wharves.....	25,783 90	25,783 90
Pier No. 54.....	284,050 95	284,050 95
Sixteenth Street Wharf.....	95,511 28	95,511 28
Central Basin wharves.....	102,511 00	102,511 00
Islais Street Wharf.....	158,813 76	123,310 04
Bulkhead Wharf, Seawall Section D.....	16,090 51	16,090 51
Bulkhead Wharf, Seawall Section C.....	14,267 29	14,267 29
Bulkhead Wharf, Seawall Section A.....	4,200 00	4,200 00

EXHIBIT A. SCHEDULE 2—Continued.

Analysis of property and equipment as of June 30, 1920, and June 30, 1919, showing comparative values of real estate, piers, wharves, buildings, equipment, etc.

	Balance June 30, 1920	Balance June 30, 1919
Piers and wharves—Continued—		
Bulkhead Wharf, Seawall Section 4.....	32,271 39	32,271 39
Bulkhead Wharf, Seawall Section 5.....	2,169 00	3,155 64
Bulkhead Wharf, Seawall Section 6.....	5,328 00	5,328 00
Bulkhead Wharf, Seawall Section 7.....	39,648 00	39,648 00
Bulkhead Wharf, Seawall Section 8.....	18,139 80	18,139 80
Bulkhead Wharf, Seawall Sections 11 and 11a.....	80,743 00	80,743 00
Bulkhead Wharf, Seawall Section 12.....	103,130 04	103,260 08
Bulkhead Wharf, Seawall Section 13.....	14,512 69	14,625 38
Passenger ferry slips—Union Depot.....	922,837 78	923,003 08
Car ferry slips—Powell street.....	283,069 60	283,069 60
Car ferry slips—China Basin.....	145,100 44	145,100 44
Total piers and wharves.....	\$14,438,614 46	\$13,965,522 57
Buildings—		
Barge office, Seawall Section B.....	\$18,714 20	\$18,714 26
Miscellaneous, Fishermen's Wharf.....	2,751 50	2,789 80
Booth market, Fishermen's Wharf.....	28,540 79	28,539 54
Free market, Fishermen's Wharf.....	1,292 42	1,156 80
Borzone market, Fishermen's Wharf.....	24,469 75	23,947 74
Boat builder's shop, Fishermen's Wharf.....	10,034 63	4,520 91
Wharfinger's office, Seawall Section 1.....	150 00	150 00
Miscellaneous sheds, Seawall Section 4.....	3,253 72	3,248 40
Miscellaneous buildings, Seawall Sections 5 and 6.....	5,213 81	5,713 81
Union Depot (includes Ferry Building extension, American Express Building, etc.).....	1,170,432 76	1,159,016 64
Concrete office buildings, Seawall Section 7.....	20,500 00	20,500 00
Post Office Building, Seawall Section 8.....	196,185 85	196,090 60
Southern Pacific Creek Route ticket office.....	3,032 78	3,032 78
Miscellaneous, Seawall Section 8.....	540 19	540 19
Wells Fargo Building, Seawall Section 9a.....	92,484 40	91,734 63
Launch offices, Seawall Section 9a.....	16,876 73	16,876 73
United States Naval Training Station Building, Pier No. 14.....	7,707 34	7,707 34
Miscellaneous, Seawall Section 9a.....	200 00	200 00
Fire house, Seawall Section 9b.....	14,113 47	14,113 47
Miscellaneous, Seawall Section 9b.....	3,954 62	3,234 91
Miscellaneous, Seawall Section 12.....	500 00	500 00
Miscellaneous, Seawall Section 13.....	150 00	150 00
Miscellaneous, Central Basin.....	250 00	250 00
Miscellaneous buildings, Seawall Lot No. 4.....	199 74	199 74
Office building and platform, Seawall Lot No. 5.....	4,341 87	4,341 87
Shed and platform, Seawall Lot No. 11.....	2,926 30	2,926 30
Building and platform, Seawall Lot No. 12.....	10,295 64	10,295 64
Market Building, Seawall Lot No. 16.....	5,476 00	5,476 00
Miscellaneous, Seawall Lot No. 17.....	63 33	63 33
Bunkers foundation, Seawall Lot No. 25.....	2,473 49	2,473 49
Total buildings.....	\$1,647,125 33	\$1,628,504 86
Sewers and pavements—		
Sewers.....	\$6,437 97	\$6,437 97
Pavements on Embarcadero.....	463,767 85	439,014 00
Pavements on streets adjoining Seawall lots.....	128,850 54	120,747 31
Total sewers and pavements.....	\$599,056 36	\$566,199 28

EXHIBIT A. SCHEDULE 2—Concluded.

Analysis of property and equipment as of June 30, 1920, and June 30, 1919, showing comparative values of real estate, piers, wharves, buildings, equipment, etc.

	Balance June 30, 1920	Balance June 30, 1919
Seawalls—		
Section E	\$251 00	\$251 00
Section D	384 48	384 48
Section B	114,601 18	114,601 18
Section A	85,614 53	85,614 53
Section 1	165,631 40	165,631 40
Section 2	167,504 09	167,504 09
Section 3	235,049 51	235,049 51
Section 4	240,872 01	240,872 01
Section 5	169,893 57	169,893 57
Section 6	126,779 73	126,779 73
Section 7	109,327 99	109,327 99
Section 8	80,000 00	80,000 00
Section 8b	111,629 12	111,629 12
Section 8a	88,008 09	88,008 09
Section 9a	383,663 03	383,663 03
Section 9b	317,615 63	317,615 63
Section 9	278,462 29	278,462 29
Section 10	116,414 75	116,414 75
Sections 11 and 11a	85,999 85	85,999 85
Section 12	97,249 95	97,249 95
Section 13	140,238 71	140,238 71
China Basin	1,383 60	1,383 60
Islais street	825 38	806 74
Rock breakwater, Fishermen's Wharf	110,329 03	110,329 03
Total seawalls	\$3,225,731 92	\$3,225,715 28
Belt railroad—round house, shops, offices, main line tracks, yards, spurs, tunnels, etc.		
Street lighting	\$735,163 44	\$650,913 50
Viaduct across Market street	114,183 82	100,973 07
Islais street vegetable oil plant	48,250 10	43,890 71
Miscellaneous (including landing floats, State boom at Hunter's Point, etc.)	109,638 21	13,237 14
Total general	\$1,028,873 99	\$830,712 84
Equipment—		
Ferry Building	\$26,453 34	\$19,376 30
Executive offices	11,683 84	8,488 44
Engineering Department	9,093 60	8,530 61
Purchasing Department	801 35	764 35
Electrical Department	19,796 97	17,428 58
Maintenance and Repair Department	79,430 46	74,052 16
Piers and wharves	1,716 49	1,531 99
Tugs and Dredgers Department	125,191 32	160,758 13
Belt Railroad	128,703 56	110,593 29
Automobiles	21,014 51	18,820 50
Fire protection	70,935 12	63,071 25
Cargo handling	8,423 47	33,549 27
Vegetable oil plant, Islais street	15,921 08	—
Oil Barge Mohican	54,876 08	38,597 50
Total equipment	\$574,044 17	\$558,562 46
Total property and equipment, Exhibit A	\$22,390,649 10	\$21,416,273 24

BOARD OF STATE HARBOR COMMISSIONERS—EXHIBIT B.
Comparative statement of revenue and expense for fiscal years ending June 30, 1920 and June 30, 1919.

	Fiscal year ending June 30, 1920		Fiscal year ending June 30, 1919	
Revenue from operation.....		\$2,330,899 11		\$2,175,250 86
Rentals.....	\$1,050,510 00		\$1,100,604 89	
Dockage.....	180,298 42		220,938 56	
Tolls.....	737,264 80		482,238 21	
Wharf demurrage.....	38,751 21		12,836 15	
Wharf storage.....	2,910 90			
Portable equipment.....	173 70			
Bak Railroad.....	321,989 99		340,652 00	
Expense of operation.....		1,129,405 04		1,027,654 01
General and operating expense.....	\$654,912 82		\$804,076 01	
Maintenance and repairs.....	461,492 22		403,628 00	
Net operating revenue.....				\$1,147,605 85
Miscellaneous receipts and adjustments.....				
Interest on bank balances.....	\$8,763 41	\$36,587 84	\$4,658 39	\$42,909 13
Interest Fort Mason Tunnel account.....	10,996 39		12,393 70	
Cash discounts earned.....	3,097 59		3,748 08	
Sales of material, damage charges, etc.....	8,513 49		9,593 94	
Settlement fire loss, Pier No. 14.....			75 95	
Refund account Seawall suit vs. bonding company.....			12,439 07	
Adjustment, materials and supplies inventory.....	216 95			
Miscellaneous expenditures and adjustments.....		20,871 52		10,955 32
Industrial accident compensation.....	\$9,778 26		\$1,876 42	
Fire insurance.....	10,636 35		6,418 60	
Settlement fire loss, Ferry Building.....	456 91			
Adjustment, materials and supplies inventory.....			2,670 30	
Net miscellaneous revenue.....				31,943 81
Total net revenue.....			5,718 32	
Fixed charges.....			\$1,207,210 39	\$1,179,549 66
			649,388 16	599,069 18
Accrued interest on bonds.....				
San Francisco Seawall Bonds.....				\$481,819 14
Second San Francisco Seawall Bonds.....	\$20,900 00	\$403,293 20	\$25,100 00	
Third San Francisco Seawall Bonds.....	360,000 00		360,000 00	
India Basin Bonds.....	80,000 00		60,119 14	
Bond maturities.....	32,363 20		27,600 00	
San Francisco Seawall Bonds.....		\$110,124 93		\$114,250 04
Current revenue surplus.....			\$114,250 04	\$583,490 48

BOARD OF STATE HARBOR COMMISSIONERS—EXHIBIT B. SCHEDULE 1.

Comparative statement of operating revenue and expense for fiscal years ending June 30, 1920 and June 30, 1919.

	June 30, 1920		June 30, 1919	
	Revenue	Expense	Revenue	Expense
Sections B, C and D of the seawall.....	\$20,834 56	\$498 92	\$19,562 60	\$1,281 41
Fishermen's Wharf.....	20,559 49	6,398 48	13,443 06	5,898 63
Car ferry slips—Powell street.....	35,401 01	821 85	23,559 19	1,181 90
Pier No. 43.....	7,376 02	3,254 58	9,039 83	1,727 07
Pier No. 41.....	57,752 88	4,138 29	46,363 20	7,819 56
Pier No. 39.....	24,789 40	9,211 76	27,353 84	2,116 88
Pier No. 37.....	52,165 67	1,654 83	54,886 18	1,607 35
Pier No. 35.....	43,961 16	2,933 47	46,343 31	1,015 65
Pier No. 33.....	21,504 39	508 38		
Pier No. 31.....	26,422 64	895 48	908 61	
Pier No. 29.....	34,361 18	2,645 45	39,335 50	970 12
Pier No. 27.....	8,128 69	1,923 43	6,515 59	8,905 96
Pier No. 25.....	17,511 78	1,702 45	16,971 46	9,617 75
Pier No. 23.....	9,747 47	3,529 30	10,369 59	8,893 31
Pier No. 21.....	14,717 87	4,699 03	16,610 35	2,522 27
Pier No. 19.....	16,313 49	6,390 39	16,381 31	10,288 86
Pier No. 17.....	23,960 56	7,838 41	23,258 04	3,937 47
Pier No. 15.....	24,223 51	6,564 22	21,997 86	1,731 30
Pier No. 11.....	28,633 25	930 26	28,102 45	912 67
Pier No. 9.....	22,804 45	3,804 89	22,428 92	2,772 74
Pier No. 7.....	31,837 33	3,313 44	22,861 70	3,545 10
Pier No. 5.....	13,860 27	84,576 77	19,465 00	8,635 85
Pier No. 3.....	33,185 40	1,457 03	13,263 23	436 51
Pier No. 1.....			9,974 09	1 51
Pier No. 14.....	13,263 37	707 31	10,463 66	3,791 62
Pier No. 16.....	12,195 14	5,822 11	9,804 23	3,934 53
Pier No. 18.....	33,028 65	3,138 74	29,978 05	2,070 92
Pier No. 20.....	32,983 70	2,874 10	31,836 02	3,554 13
Pier No. 22.....	16,072 21	800 36	13,811 59	1,395 49
Pier No. 24.....	16,632 12	1,677 35	18,642 63	1,162 30
Pier No. 26.....	28,369 72	4,476 70	27,899 27	1,476 34
Pier No. 28.....	44,357 87	8,289 42	41,609 41	2,620 34
Pier No. 30.....	31,413 81	10,592 42	23,187 53	3,486 79
Pier No. 32.....	69,144 98	4,997 00	52,538 43	5,257 10
Pier No. 34.....	48,863 79	6,513 10	52,848 74	8,455 78
Pier No. 36.....	29,169 79	453 66	24,158 97	349 27
Pier No. 38.....	37,132 76	3,554 29	39,577 39	9,644 41
Pier No. 40.....	29,804 63	6,835 95	22,306 92	3,831 41
Pier No. 42.....	24,926 69	3,316 38	23,061 54	7,523 83
Pier No. 44.....		2,727 67	43,823 67	27,758 85
Pier No. 46.....	72,363 80	3,196 53		1,705 91
Berry Street Wharf.....	53,952 53	2,160 85	50,796 44	2,402 14
Third Street Wharf.....	11,884 04	2,534 30	11,919 60	4,516 57
Channel Street wharves.....	9,695 85	3,579 54	9,237 54	6,033 21
China Basin wharves.....	8,403 35	385 88	8,792 17	365 66
Pier No. 54.....	56,311 29	394 98	67,720 42	8,045 90
Central Basin wharves and car ferry slips.....	35,780 96	235 33	33,469 88	402 78
Tulare Street wharf.....	123,848 23	6,952 58	126,007 10	13,428 69
Islands Street Wharf—outer.....	3,696 35		4,354 70	
Islands Street Wharf—inner.....	3,478 84	4,487 71	2,948 17	5,604 83
Ferry Building (Union Depot) and ferry slips.....	7,934 45		7,918 13	333 87
Seawall lots and lands.....	391,648 54	219,933 16	370,326 35	135,656 94
El Embarcadero Loop.....	145,424 80	1,731 61	140,737 40	1,147 98
Miscellaneous rents.....	12,000 00		12,000 00	
Streets.....	7,820 82		7,740 00	
Fog bells and underground system.....		61,446 53		92,203 17
Belt Railroad.....		4,113 96		2,348 58
Tugs and dredgers.....	321,989 99	298,414 54	340,652 00	301,444 73
Wharfingers and collectors.....		89,521 43		90,708 56
Office, administrative and legal.....		49,971 23		48,242 33
Police and fire protection.....		87,829 35		62,926 44
Portable equipment.....		21,626 63		26,257 30
Islands Creek vegetable oil plant.....	173 70	2,575 56		
Landing floats.....	4,000 00	3,868 82		
General.....		5,587 39		
		35,483 54		50,950 35
Total operating revenue and expense, Exhibit B.....	\$2,330,899 11	\$1,129,405 04	\$2,175,259 86	\$1,027,654 01

BOARD OF STATE HARBOR COMMISSIONERS
Analysis of revenue from operation for

	Total		Rentals	
	June 30, 1920	June 30, 1919	June 30, 1920	June 30, 1919
Sections B, C and D of the seawall.....	\$20,834 56	\$19,562 60	\$8,959 40	\$7,056 88
Fishermen's Wharf.....	20,559 49	13,448 09	9,762 49	3,013 56
Car ferry slips—Powell street.....	35,401 01	25,559 19	69 00	.....
Pier No. 43.....	7,376 02	9,039 83	1,982 50	2,067 50
Pier No. 41.....	57,752 88	46,363 20	16,238 57	24,839 85
Pier No. 39.....	24,789 40	27,353 84	.....	11,597 88
Pier No. 37.....	52,165 00	54,889 18	15,979 23	28,505 83
Pier No. 35.....	43,931 16	46,343 31	14 0 9 80	25,397 96
Pier No. 33.....	21,504 39	.....	5,762 12	.....
Pier No. 31.....	25,422 64	908 61	11,087 77	358 51
Pier No. 29.....	34,391 18	39,335 50	13,743 30	22,342 00
Pier No. 27.....	8,128 69	6,515 59	1,115 52	1,616 26
Pier No. 25.....	17,511 78	16,971 46	2,104 74	8,255 82
Pier No. 23.....	9,747 47	10,390 59	3,270 05	3,193 32
Pier No. 21.....	14,717 87	16,610 35	2,685 31	8 655 89
Pier No. 19.....	16,313 49	16,581 31	6,942 12	6,732 12
Pier No. 17.....	23,930 56	23,258 04	11 6 6 80	11 851 00
Pier No. 15.....	24,223 51	21,997 86	15,346 16	15,273 63
Pier No. 11.....	28 636 25	28,102 45	7,454 44	13,676 17
Pier No. 9.....	22,804 45	22,438 92	11,054 97	9,390 00
Pier No. 7.....	31 857 33	22 851 70	21,142 59	12,735 28
Pier No. 5.....	13,860 27	19,465 00	8,630 00	8,760 00
Pier No. 3.....	33,185 40	13,283 23	20,690 44	7,363 85
Pier No. 1a.....	.....	9,974 09	.....	3,669 40
Pier No. 1.....	13,263 37	10,493 63	3,095 04	3,035 04
Pier No. 14.....	12,195 14	9,894 23	7,964 48	6 552 48
Pier No. 16.....	33 028 65	29,978 05	18,961 32	18,601 32
Pier No. 18.....	32,986 70	31,836 02	17,382 84	17,692 84
Pier No. 20.....	16 072 21	13 811 59	9,040 44	8,501 44
Pier No. 22.....	16 632 12	18,642 63	8,179 68	8,179 68
Pier No. 24.....	28,389 72	27,899 27	16,534 56	17,337 28
Pier No. 26.....	44,357 87	41,609 41	11,535 20	22,718 56
Pier No. 28.....	31,413 81	23,187 53	7,533 96	9,898 92
Pier No. 30.....	69,144 98	52,538 43	13,393 17	21,293 58
Pier No. 32.....	48,866 79	52,848 74	12,698 70	23,980 76
Pier No. 34.....	29,169 79	24,158 97	11,181 95	11,200 29
Pier No. 36 and car ferry slips.....	37,122 76	39,577 39	4,441 20	10,106 86
Pier No. 38.....	29,804 66	22,306 92	8,713 63	11,617 06
Pier No. 40.....	24,926 60	26 064 54	13,212 95	15 650 67
Piers Nos. 42 and 44.....	72,363 80	43,823 67	24,778 23	28,270 63
Pier No. 46.....	55,952 53	50,796 44	14,095 44	25,169 02
Berry Street Wharf.....	11,884 04	11,919 60	5,765 28	5,765 28
Third Street Wharf.....	9,695 85	9,237 54	2,344 11	2,780 56
Channel Street Wharves.....	8,403 35	8,792 17	5,340 00	5,340 00
China Basin Wharves and car ferry slips.....	56 311 29	67,720 42	11,540 08	13,521 29
Pier No. 54.....	35,780 96	33,469 88	19,314 12	19 314 12
Central Basin Wharves and car ferry slips.....	123,848 23	126,007 10	49,187 46	48,542 54
Tulare Street Wharf.....	3,636 35	4,354 70	240 00	240 00
Islais Street Wharf—outer.....	3,478 84	2,948 17	.....	32 40
Islais Street Wharf—inner.....	7,934 45	7,918 13	150 00	950 00
Ferry Building (Union Depot).....	391,648 54	370,326 35	375,6 8 28	356,757 15
Seawall lots and lands.....	145,424 80	140,737 40	145,424 80	140,737 40
El Embarcadero Loop.....	12 600 00	12,000 00	12,000 00	12,000 00
Miscellaneous rents.....	7,820 82	7,740 00	7,820 82	7,740 00
Portable equipment.....	173 70	.....	.....	.....
Belt Railroad.....	321,989 99	340,652 00	.....	.....
Islais Creek vegetable oil plant.....	4,000 00	.....	4,000 00	.....
Total revenue from operation, Exhibit B	\$2,330,899 11	\$2,175,269 86	\$1,050,510 09	\$1,109,604 89

fiscal years ending June 30, 1920 and June 30, 1919.

Dockage		Tolls		Wharf demurrage and wharf storage		Miscellaneous	
June 30, 1920	June 30, 1919	June 30, 1920	June 30, 1919	June 30, 1920	June 30, 1919	June 30, 1920	June 30, 1919
\$3,198 30		\$8,636 86	\$9,078 82				
10,797 00	\$3,426 90				10,429 50		
1,584 05	2,990 35	35,341 01	26,550 19				
7,749 95	7,959 10	3,399 74	3,818 78	\$409 73	157 20		
4,437 90	6,148 10	31,429 34	13,324 40	2,305 02	239 85		
3,594 10	10,772 50	18,662 86	9,463 41	1,688 64	141 45		
2,528 75	6,777 30	27,033 26	15,532 85	5,560 01	75 00		
1,382 75		23,812 30	14,168 05	3,580 31			
3,079 60	5 30	13,528 14			831 38		
1,903 80	4,934 65	12,109 02	544 80		146 25		
1,453 70	906 60	17,676 35	12,047 55	1,087 73	10 70		
2,606 20	3,192 70	3,979 42	3,916 23	1,580 06	46 50		
1,631 80	3,334 65	12,479 09	5,522 94	321 75			
2,179 10	2,854 50	4,325 26	3,749 07		470 35	83 35	
6,271 20	6,456 20	9,395 21	5,099 96		1,057 25		
3,531 03	4,022 20	3,009 42	3,183 39		90 75	9 60	
4,211 95	4,118 90	8,196 30	7,136 19		624 40	248 05	
2,334 05	6,476 25	4,655 40	2,606 40				
6,026 25	6,534 80	18,170 51	7,950 03	707 25			
3,778 35	3,487 55	5,719 48	6,513 52	3 75			
2,944 30	6,488 90	6,986 39	6,306 87		333 00		
5,241 75	2,505 05	2,315 22	4,181 60	75	39 50		
	2,798 65	7,239 96	3,390 83	43 25	50		
			3,503 74		2 30		
6,404 75	4,879 45	3,763 08	2,552 17	50			
3,790 80	2,833 50	439 86	508 25				
3,973 75	2,846 95	9,904 95	8,465 33	188 63	64 45		
4,677 15	3,595 45	10,375 45	10,262 58	551 26	295 15		
2,437 90	1,971 35	4,263 49	3,194 00	330 38	144 80		
2,381 70	3,161 55	6,043 61	7,234 55	57 13	66 85		
2,845 60	3,791 95	8,567 47	6,693 64	422 09	76 40		
4,791 60	8,455 60	22,588 92	10,325 35	5,442 15	109 90		
6,348 85	5,812 60	17,064 38	7,475 01	463 62	1 00		
3,740 30	9,288 00	50,710 97	21,886 85	1,297 54	70 00		
5,598 80	12,211 35	26,509 37	16,582 58	4,059 92	124 05		
2,929 70	5,146 20	14,945 63	7,812 48	112 50			
1,685 15	5,374 85	29,447 15	24,095 63	1,549 26			
6,276 75	4,198 50	14,693 50	6,491 37	117 75			
2,966 85	4,284 85	8,270 47	6,110 52	456 32	18 50		
6,134 76	5,571 15	40,464 07	9,961 89	986 77			
6,168 20	8,600 25	35,507 00	17,027 17	1,181 89			
2,171 55	2,457 85	3,947 21	3,696 47				
3,051 05	3,211 90	4,117 69	3,220 29	183 00	24 80		
1,709 75	1,841 80	1,353 60	1,610 37				
6,104 15	11,909 60	38,463 23	42,539 03	203 83			
2,056 30	3,829 80	10,884 24	10,312 41	3,525 70	13 75		
10,664 35	10,208 10	63,968 17	67,256 46	20 25			
947 25	1,101 25	2,509 10	3,013 45				
2,163 70	1,963 20	1,315 14	932 57				
4,741 20	5,179 75	3,043 25	1,788 88				
		16,040 26	13,569 20				

BOARD OF STATE HARBOR COMMISSIONERS—EXHIBIT B. SCHEDULE 3.
Analysis of expense of operation for fiscal years ending June 30, 1920 and June 30, 1919

	Totals		General and operating expense		Repairs and maintenance
	June 30, 1920	June 30, 1919	June 30, 1920	June 30, 1919	
Sections B, C and D of the seawall					
Fishermen's Wharf					
Car ferry slips—Powell street					
Pier No. 43	\$498 92	\$1,231 41	\$105 56	\$76 56	\$393 36
Pier No. 44	6,398 48	5,898 63	4,844 12	2,462 83	1,554 36
Pier No. 45	821 85	1,181 90	22 63	11 95	799 22
Pier No. 41	3,254 58	1,727 07	1,690 56	155 44	1,584 02
Pier No. 39	4,138 29	7,819 56	550 28	1,567 92	3,568 01
Pier No. 37	9,211 76	2,116 88	2,034 25	1,968 62	7,177 51
Pier No. 35	1,654 83	1,607 35	744 13	884 96	150 26
Pier No. 33	2,933 47	1,015 65	624 43	810 35	910 70
Pier No. 31	506 38		390 75		2,309 04
Pier No. 29	895 48		497 75		117 63
Pier No. 27	2,645 45		815 84		387 73
Pier No. 25	1,928 43	970 12	382 68	623 49	1,829 61
Pier No. 23	1,702 45	8,905 96	375 94	1,299 61	1,545 75
Pier No. 21	3,529 30	9,617 79	2,181 35	407 09	7,406 35
Pier No. 19	4,699 03	8,893 31	2,016 13	1,856 23	1,326 51
Pier No. 17	6,390 39	2,522 27	795 83	417 62	1,347 95
Pier No. 15	7,838 41	10,288 86	930 24	807 97	7,037 95
Pier No. 11	6,554 82	3,987 47	14 44	1,568 45	2,104 65
Pier No. 9	900 26	1,781 30	510 30	119 21	9,480 89
Pier No. 7	3,804 89	912 67	1,395 22	440 72	2,369 02
Pier No. 5	3,313 44	2,772 74	722 85	1,543 84	1,612 09
Pier No. 3	84,576 77	3,545 10	670 34	2,277 43	471 95
Pier No. 1a	1,457 03	8,635 85	678 21	1,478 14	2,409 67
Pier No. 1		436 51		169 54	2,590 59
Pier No. 14	707 31	1 51			1,957 67
Pier No. 16	5,822 11	3,791 62			7,157 71
Pier No. 18	3,138 74	3,934 53			285 97
Pier No. 20	2,874 10	2,070 92	596 60	1,703 87	
Pier No. 22	800 36	3,554 13	538 30	2,174 26	2,087 75
Pier No. 24	1,677 35	1,395 49	474 38	684 17	5,225 51
Pier No. 26	4,476 70	1,162 30	260 68	642 81	2,600 44
Pier No. 28	8,289 42	1,476 34	295 88	446 31	1,403 75
Pier No. 30	10,592 42	2,920 34	468 00	768 98	2,939 72
	4,997 00	3,486 79	234 91	1,381 49	949 18
		5,257 10	444 14	1,881 49	393 32
				4,008 70	933 77
				7,782 78	2,106 69
				10,297 51	3,051 83
				4,152 88	4,742 35

Pier No. 32	0.513 10	8,455 78	784 80	827 26	5,728 30	7,628 52
Pier No. 34	453 96	349 27	448 50	249 27	5 00	
Pier No. 36 and car ferry slips	3,554 29	9,644 41	963 79	1,046 98	2,590 50	8,597 43
Pier No. 38	6,835 95	3,831 41	1,423 87	1,071 88	5,412 08	2,759 53
Pier No. 40	3,316 38	7,523 83	457 50	443 59	2,858 88	7,080 24
Pier No. 42	2,727 87	27,758 89	270 31	265 77	2,457 36	27,493 12
Pier No. 44	3,196 53	1,706 91	342 17	772 71	2,854 36	933 30
Berry Street Wharf	2,160 86	2,402 14	483 81	646 44	1,677 05	1,756 70
Third Street Wharf	2,534 30	4,516 57	511 38	511 38	2,534 30	4,005 21
Channel Street Wharves	3,579 54	6,033 21	1,701 44	717 44	1,878 10	5,315 77
China Basin Wharves	385 88	365 66			385 88	365 66
Pier No. 54	304 93	8,045 90	277 63	1,970 60	27 30	6,075 30
Central Basin Wharves and car ferry slips	235 83	402 78	235 83	402 78		12,487 34
Islands Street Wharf—inner	6,952 98	13,428 69	756 57	941 35	6,196 01	
Islands Street Wharf—outer		333 87				333 87
Ferry Building (Union Depot) and ferry slips		5,604 83	858 43	869 38	3,629 28	4,735 45
Seawall lots and lands	4,487 71	135,656 94	114,363 67	93,875 53	105,569 49	41,781 41
Streets	219,933 16					1,096 18
Fog bells and underground system	1,731 64	1,147 98	36,520 45	51 80	24,926 08	54,019 18
Belt Railroad	61,446 53	92,203 17	2,069 22	1,097 89	2,024 74	1,750 69
Dredges and dredgers	4,113 96	2,548 58	212,871 54	208,925 54	85,543 00	92,519 19
Wharfers and collectors	288,414 54	301,444 73	65,178 35	58,381 73	21,343 08	32,821 83
Office, administrative and legal	86,521 43	90,703 56	49,971 23	48,242 38		
Police and fire protection	49,971 23	48,242 38	87,829 35	62,926 44		
General	87,829 35	62,926 44	21,628 66	26,257 50		
Portable equipment	21,628 66	26,257 50	33,238 01	45,662 84	2,186 53	5,357 51
Landing floats	36,483 54	50,960 35	1,359 17		1,216 39	
Islands Creek vegetable oil plant	2,575 56				5,587 39	
	3,988 82		3,968 82			
Total expense of operation, Exhibit B	\$1,129,405 04	\$1,027,654 01	\$661,912 82	\$824,028 01	\$464,492 22	\$403,623 00

BOARD OF STATE HARBOR COMMISSIONERS—EXHIBIT B. SCHEDULE 4.

BELT RAILROAD

Comparative statement of revenue and expense of Belt Railroad for fiscal years ending June 30, 1920 and June 30, 1919
REVENUE

	June 30, 1920		June 30, 1919	
	Revenue	Number of switches	Revenue	Revenue per switch
From switching—				
Local switches at \$3.25 per car	\$16 25	5	\$242,898 50	74,738
Local switches at \$2.50 per car	227,580 00	91,032	74,670 00	29,888
Local switches at \$3.00 per car	61,095 00	20,365		
Local switches, Islais Creek, at \$1.20 per car	392 40	327		
Baggage cars at \$5.00 per car	2,470 00	494	5,380 00	1,072
Passenger cars at \$10.00 per car	90 00	9	1,170 00	117
Empiles at \$3.25, \$2.50 and \$1.50 per car	1,225 75	630	618 00	405
Total switching revenue	\$292,870 40	112,922	\$324,716 50	106,200
From incidentals to switching—				\$3,058
Revenue incidental to above service, switching moves on which have been included above:				
Rental charges \$2.50 and \$0.50 per car per day	\$6,353 80		\$3,477 00	
Storage charges \$3.00 per car per day	17,498 00		9,619 00	
Sunday service—charges for use of engine and crew in addition to regular switching charge	2,355 00		2,550 00	
Equipment rental	2,739 95		230 00	
Miscellaneous	172 84		59 50	
Total incidental revenue	\$25,119 59		\$15,935 50	\$0.15
Total revenue per Exhibit B	\$321,989 99	112,922	\$340,652 00	\$3,208

EXPENSE

	June 30, 1920			June 30, 1919		
	Expense	Number of switches	Expense per switch	Expense	Number of switches	Expense per switch
Maintenance of equipment—						
Locomotives	\$26,346 78			\$26,171 34		
Flat car and crane car	273 13			107 77		
Shop machinery and tools	1,173 97			298 10		
Foreign freight cars	381 75			433 35		
Superintendence	3,624 81			2,776 56		
Total maintenance of equipment	\$31,800 44		\$0.282	\$29,787 12		\$0.28
Maintenance of roadway and buildings—						
Track repairs and renewals	\$49,270 09			\$61,285 54		
Office buildings	515 64			270 80		
Shops and roundhouses	3,956 83			1,175 73		
Total maintenance of roadway and buildings	\$53,742 56		\$0.476	\$62,732 07		\$0.591
Operating expense—						
Yardmasters and clerks	\$12,304 70			\$13,075 52		
Trainmen	112,096 75			114,595 68		
Engine house supplies	12,979 65			13,637 28		
Fuel and water for locomotives	58,283 97			56,078 03		
Locomotive supplies and expense	4,687 62			2,469 61		
Clearing wrecks	752 49			72 06		
Total operating expense	\$200,485 18		\$1.776	\$200,228 18		\$1.885
Administrative and general	\$12,383 36		\$0.109	\$8,607 36		\$0.062
Total expense per Exhibit B, Schedule 1	\$208,414 54	112,922	\$2.613	\$301,444 73	106,200	\$2.838
Net operating revenue	\$23,675 45	112,922	\$0.208	\$39,207 27	106,200	\$0.37

**DETAIL OF PROPERTY ACQUIRED FROM REVENUE FUND.
FISCAL YEAR 1918-1919 and 1919-1920.**

	Fiscal year ending June 30, 1919	Fiscal year ending June 30, 1920	Total two years
Piers and wharves—			
Fisherman's wharves	\$23,990 27	\$23,425 36	\$47,415 63
Pier 43	40,478 06	40,289 86	80,767 92
Pier 41	24,974 62	37,707 31	62,681 93
Pier 33	28,377 84	79,178 40	107,556 24
Pier 31	9,700 24	30,102 86	39,803 10
Pier 29	3,596 77	7,586 34	11,183 11
Pier 27	21,629 77	40,728 17	62,357 94
Pier 25	338 91	92,737 24	93,076 15
Pier 21	81,442 47	2,224 26	83,666 73
Pier 5	1,359 67	46,005 31	47,364 98
Pier 1	44,908 41	883 69	44,024 72
Pier 3	9,572 59	1,581 73	11,154 37
Pier 20	147 03	10,143 99	10,291 02
Piers 30 and 32	9,841 54	4,645 57	14,487 11
Pier 42	31,765 76	299 13	32,064 89
Islands St. Inner	960 60	35,503 72	36,464 32
Miscellaneous	2,542 15	19,078 90	16,536 75
	(Credit)		
Total piers and wharves	\$240,725 58	\$472,121 89	\$712,847 47
Buildings—			
Fisherman's Wharf (miscellaneous)	\$56,460 46	\$6,134 30	\$62,594 75
Union Depot	15 01	11,416 12	11,431 13
Post Office	21,742 14	95 25	21,837 39
Miscellaneous	746 38	974 80	1,721 18
Total buildings	\$78,963 96	\$18,620 47	\$97,584 45
Sewers and pavements—			
Pavement—Embarcadero	\$5,479 68	\$24,753 85	\$31,233 53
Pavement—streets adjoining		8,103 23	8,103 23
Total sewers and pavements	\$6,479 69	\$32,857 08	\$39,336 76
Seawalls—			
Islands Street	\$808 74	\$16 64	\$825 38
Fisherman's—Rock breakwater	1,493 52		1,493 52
Total seawalls	\$2,302 26	\$16 64	\$2,318 90
General—			
Belt Railroad structures and roadway	\$36,064 82	\$84,249 94	\$120,314 76
Street lighting	1,655 99	13,210 75	14,866 74
Viaduct, Ferry	38,430 55	4,359 39	42,789 94
Islands Street Vegetable Oil Plant	13,267 14	96,341 07	109,608 21
Total general	\$89,418 50	\$198,161 15	\$287,579 65
Equipment—			
Belt Railroad	\$2,047 51	\$1,277 55	\$3,325 06
Tugs and dredgers	214 90	30,495 47	30,280 57
Automobiles	167 81	7,194 01	7,361 82
Fire protection	29,414 63	4,863 87	34,306 50
Cargo handling	33,549 27	328 12	33,877 39
Vegetable Oil Plant		13,799 88	13,799 88
Vegetable Oil Barge "Mohican"	38,597 59	16,278 47	54,876 06
Miscellaneous departments	18,449 31	7,235 23	25,683 59
Total equipment	\$122,470 02	\$20,481 71	\$142,951 73
Total property and equipment acquired	\$544,296 23	\$738,322 08	\$1,282,618 96

MONTHLY INCOME FROM UNION DEPOT AND FERRY BUILDING
AS OF JULY 1, 1920.

Tenants	Monthly Rental
American Railway Express Company.....	\$3,611 18
Atchison, Topeka and San Santa Fe Railway Company.....	78 84
Chas. Badaracco.....	30 00
Brown News Company.....	15 00
Butler & Son.....	550 00
P. D. Bernhard.....	100 00
California Development Board.....	350 00
California Safety Locker Company (average).....	20 92
Cohen & Figone.....	407 67
Fish and Game Commission.....	15 00
Foster and Orear Confectioners, Inc.....	4,000 00
Ferry Bakerite Company.....	750 00
Golden Gate Music Company.....	150 00
J. Gordon.....	200 00
Robert Green Company.....	100 00
McPartland and Reich.....	825 00
Monticello Steamship Company.....	115 00
N. Morgenthau.....	20 00
Master Freight and Transfer Company.....	60 00
Northwestern Pacific Railroad Company.....	4,448 85
Oakland, Antioch & Eastern Railway.....	63 36
Pacific Telephone and Telegraph Company.....	794 06
Postal Telegraph and Cable Company.....	80 00
Presta & Adieco.....	77 50
Pullman Car Lines.....	100 00
J. A. Richardson.....	200 00
State Board of Prison Directors.....	75 00
State Department of Agriculture.....	87 50
State Motor Vehicle Department.....	126 72
State Mining Bureau.....	199 50
Spring Valley Water Company.....	60 00
Southern Pacific Company.....	6,778 04
San Francisco-Oakland Terminal Railways.....	2,596 59
San Francisco Board of Education.....	25 00
Taxicab Company of California.....	100 00
Travelers' Aid Society of California.....	10 00
J. H. Taylor.....	75 00
United States Department of Forestry.....	1,000 00
United States Department of Agriculture.....	50 00
United States Post Office Department.....	3,160 00
United States Shipping Board.....	25 00
Union Sales Corporation.....	100 00
Union Transfer Company.....	250 30
Van Noy Interstate Company.....	400 00
Western Pacific Railroad Company.....	1,368 20
Western Union Telegraph Company.....	85 00
Total.....	\$33,724 23

**MONTHLY AND TERM INCOMES FROM LEASES OF SEAWALL LOTS WHICH
WERE EXECUTED PRIOR TO JULY 1, 1920.**

Lot	Lessee and term	Monthly rental	Total for term of lease	Total for five-year period
15 and portions of 14 }	Southern Pacific Company, 25 years from August 1, 1901-----	\$500 00	\$30,000 00	\$150,000 00
16	P. J. Moliterno, 25 years from May 1, 1909-----	1st 5 years, 101 00 2d 5 years, 105 00 3d 5 years, 110 00 4th 5 years, 115 00 5th 5 years, 120 00	6,060 00 6,300 00 6,600 00 6,900 00 7,200 00	33,060 00
4, subd. A	National Packing Company (assigned to Swift & Co.), 25 years from July 1, 1909-----	1st 5 years, 152 00 2d 5 years, 160 00	\$9,120 00 8,968 00	18,080 00
	(Canceled March 1, 1919; refund, \$2,208.00 of last year's rent paid in advance)			
23	Southern Pacific Company, 25 years from October 1, 1909-----	1st 5 years, 990 00 2d 5 years, 1,325 00 3d 5 years, 1,271 90 4th 5 years, 1,422 80 5th 5 years, 1,552 14	\$59,400 00 79,500 00 76,314 00 85,368 00 93,128 40	\$393,710 40
	Amended October 23, 1919; effective October 1, 1919.			
24, subd. A	Associated Oil Company, 25 years from October 1, 1909-----	1st 5 years, 214 00 2d 5 years, 245 00 3d 5 years, 275 00 4th 5 years, 306 00 5th 5 years, 337 00	\$12,840 00 14,700 00 16,500 00 18,360 00 20,220 00	82,620 00
	Assigned to W. R. Grace & Co. October 31, 1918.			
24, subd. B	Southern Pacific Company, 25 years from October 1, 1909-----	1st 5 years, 750 00 2d 5 years, 1,000 00 3d 5 years, 1,125 00 4th 5 years, 1,250 00 5th 5 years, 1,375 00	\$45,000 00 60,000 00 67,500 00 75,000 00 82,500 00	330,000 00
	Assigned to Pacific Mail Steamship Company November 10, 1919.			
18	Crescent Lumber Company (assigned to San Francisco Lumber Company), 25 years from April 1, 1910-----	1st 5 years, 225 00 2d 5 years, 230 00 3d 5 years, 235 00 4th 5 years, 240 00 5th 5 years, 245 00	\$13,500 00 13,800 00 14,100 00 14,400 00 14,700 00	70,500 00
17	Western Pacific Railway Company, 25 years from July 1, 1910-----	1st 5 years, 1,083 33 2d 5 years, 1,151 04 3d 5 years, 1,218 75 4th 5 years, 1,286 46 5th 5 years, 1,354 17	\$61,999 80 69,062 40 73,125 00 77,187 60 81,250 20	365,625 00
22, subd. A	Western Pacific Railway Company, 25 years from August 1, 1910-----	1st 5 years, 1,346 39 2d 5 years, 1,430 54 3d 5 years, 1,514 09 4th 5 years, 1,598 84 5th 5 years, 1,682 98	\$80,783 40 85,832 40 90,881 40 95,930 40 100,978 80	454,406 40
22, subd. B	Western Pacific Railway Company, 22 years and 7 months from January 1, 1913-----	2 yr., 7 mo., 249 09 1st 5 years, 264 66 2d 5 years, 270 23 3d 5 years, 295 79 4th 5 years, 311 36	\$7,721 79 15,879 60 16,813 80 17,747 40 18,681 60	76,844 19
19	Atchison, Topeka and Santa Fe Railway Company, 15 years from August 1, 1914-----	\$170 60	\$10,236 00	\$30,708 00

MONTHLY AND TERM INCOMES FROM LEASES OF SEAWALL LOTS WHICH
WERE EXECUTED PRIOR TO JULY 1, 1920—Continued.

Lot	Lessee and term	Monthly rental	Total for term of lease	Total for five-year period
25	W. R. Grace & Co., 20 years from May 17, 1917-----	\$318 05	\$19,083 00	\$76,332 00
Portion of C	Shell Company of California, 25 years from September 15, 1917-----	1st 5 years, \$339 06 2d 5 years, 389 92 3d 5 years, 448 41 4th 5 years, 515 65 5th 5 years, 692 99	\$20,343 69 23,395 20 26,904 60 30,939 00 35,579 40	137,161 80
21	Toyo Kisen Kaisha, 5 years from January 1, 1918-----	\$150 00	\$9,000 00	9,000 00
Portion of A	Purity Spring Water Company, 15 years from January 31, 1918-----	1st 5 years, \$50 00 2d 5 years, 55 00 3d 5 years, 60 50	\$3,000 00 3,300 00 3,630 00	9,930 00
Islais Creek	H. W. Peabody & Company, 10 years from September 18, 1919-----	1st 5 years, \$62 50 2d 5 years, 75 00	\$3,750 00 4,500 00	8,250 00
Islais Creek	Balfour, Guthrie & Co., 10 years from September 18, 1919-----	1st 5 years, \$62 50 2d 5 years, 75 00	\$3,750 00 4,500 00	8,250 00
Islais Creek	Willitts & Patterson, 10 years from September 18, 1919-----	1st 5 years, \$125 00 2d 5 years, 150 00	\$7,500 00 9,000 00	16,500 00
Islais Creek	Hind, Rolph & Company, 10 years from September 18, 1919-----	1st 5 years, \$62 50 2d 5 years, 75 00	\$3,750 00 4,500 00	8,250 00
Islais Creek	S. L. Jones & Company, 10 years from September 18, 1919-----	1st 5 years, \$62 50 2d 5 years, 75 00	\$3,750 00 4,500 00	8,250 00
Total-----				\$2,285,429 79



Cargo Masts in Use at Pier 29.

PART VII.

CONTRACTS.

294	Sept. 6, 1917	Constructing Pier No. 33 and adjacent bulkhead wharf.	Healy-Tribbitts Construction Co.	<div> <div> (Extras)</div> <div> \$327,220 00 3,669 05 </div> </div>	<div> <div> Prior to July 1, 1918 July 8, 1918 Aug. 1, 1918 Sept. 5, 1918 Oct. 3, 1918 Nov. 7, 1918 Dec. 5, 1918 Jan. 9, 1919 Feb. 6, 1919 Mar. 13, 1919 May 6, 1920 </div> <div> \$201,240 30 12,270 75 7,382 45 2,464 15 4,908 30 4,908 30 4,908 30 4,908 30 2,464 15 79,305 00 2,300 00 </div> </div>	<div> <div> Feb. 6, 1919</div> <div> \$327,220 00 </div> </div>
				<div> <div> Extras</div> <div> ----- </div> </div>	<div> <div> Dec. 6, 1918 Feb. 6, 1919 Mar. 6, 1919 Aug. 23, 1919 </div> <div> \$20 86 3,500 70 135 00 42 49 </div> </div>	<div> <div> 3,669 05</div> <div> \$330,919 05 </div> </div>
296	Nov. 1, 1917	Making repairs and additions, Pier No. 41.	Healy-Tribbitts Construction Co.	<div> <div> (Extras)</div> <div> \$113,723 00 2,464 37 </div> </div>	<div> <div> Prior to July 1, 1918 July 11, 1918 Aug. 15, 1918 Aug. 15, 1918 Feb. 2, 1920 Prior to July 1, 1918 July 25, 1918 July 25, 1918 July 25, 1918 Aug. 23, 1918 </div> <div> \$76,763 02 8,228 23 28,430 75 300 00 1,798 17 22 19 14 37 629 64 </div> </div>	<div> <div> July 11, 1918</div> <div> \$116,187 37 </div> </div>

CONTRACT WORK UNDER WAY AT DATE OF LAST BIENNIAL REPORT AND SINCE COMPLETED—Concluded.

No.	Date of contract	Description	Contractors	Contract price	Payments	Date of payments	Total	Date of completion
309	June 13, 1918	Furnishing materials and constructing shed on Pier 31 and connecting building between Piers 29 and 31.	W. B. Kyle-----	\$102,000 00 (Extras) 7,108 45	\$7,650 00 20,655 00 7,650 00 7,650 00 6,885 00 5,855 00 13,005 00 6,120 00 1,530 00 23,000 00 2,500 00 303 50 180 52 348 82 754 58 3,996 53 180 52 262 20 685 22 289 30 8 81 74 09 95 36	Oct. 3, 1918 Nov. 7, 1918 Dec. 5, 1918 Jan. 9, 1919 Feb. 6, 1919 Mar. 6, 1919 April 3, 1919 May 1, 1919 May 8, 1919 June 12, 1919 July 31, 1919 Dec. 5, 1918 Jan. 16, 1919 Feb. 13, 1919 Feb. 20, 1919 Feb. 20, 1919 Feb. 20, 1919 April 3, 1919 April 24, 1919 May 12, 1919 May 12, 1919 May 12, 1919 May 15, 1919 May 29, 1919	\$109,108 45	May 8, 1919
				\$109,108 45				

310	June 21, 1918	Paving portion of Embarcadero, Section 8A, 1B, Ferry Loop to Pier No. 1.	J. J. McHugh. (Assigned to Hugh Crumney, July 8, 1918)	<p>Bid—2½" bituminous concrete pavement on 6" concrete base @ \$0.20 per sq. ft.</p> <p>2 ½" bituminous concrete pavement on special concrete base @ \$0.16 per sq. ft.</p> <p>Basalt block pavement on 6" concrete base @ \$0.38 per sq. ft.</p> <p>Catch basins @ \$0.50 each.</p> <p>Concrete curb @ \$0.50 per lin. ft.</p> <p>Iron stone sewer pipe @ \$0.50 per ft.</p>	<p>\$7,211 25</p> <p>4,818 75</p> <p>3,200 82</p> <p>5,076 77</p> <p>*177 48</p> <p>*105 40</p>	<p>Sept. 5, 1918</p> <p>Oct. 3, 1918</p> <p>Oct. 31, 1918</p> <p>Dec. 5, 1918</p> <p>Oct. 3, 1918</p> <p>Dec. 5, 1918</p>	<p>\$20,589 97</p>	Oct. 31, 1918
				*Extras				

WORK CONTRACTED FOR AND COMPLETED WITHIN BIENNIAL PERIOD 1918-1920

No.	Date of contract	Description	Contractors	Contract price	Payments	Date of payments	Total	Date of completion
311	Aug. 1, 1918	Furnishing materials and constructing bulkhead wharf and connecting building, Pier No. 27.	J. D. Hannah-----	\$13,773 00 (Extras) 72 33	\$1,239 57 339 89 1,850 36 4,338 49 1,023 98 732 08 826 38 3,443 25 72 33	Sept. 5, 1918 Nov. 7, 1918 Dec. 5, 1918 Jan. 9, 1919 Feb. 6, 1919 Mar. 1, 1919 Mar. 27, 1919 May 1, 1919 May 29, 1919	\$13,845 33	Mar. 27, 1919
312	Aug. 22, 1918	Furnishing materials and constructing extension to Pier No. 21.	Healy-Tibbitts Construction Co.	\$3,733 00 (Extras) 1,875 82	\$16,399 87 8,199 94 7,543 94 656 00 10,983 25 1,876 82	Jan. 9, 1919 Feb. 6, 1919 Mar. 6, 1919 Mar. 13, 1919 April 17, 1919 May 1, 1919	\$45,608 53	Mar. 13, 1919
313	Sept. 19, 1918	Furnishing materials and constructing fish packing house and market, foot of Taylor street.	Robert Trost-----	\$20,049 00 (Extras) 150 42	\$1,503 67 3,759 19 3,007 35 3,759 19 2,856 98 1,037 37 5,012 25 150 42	Nov. 7, 1918 Dec. 5, 1918 Jan. 9, 1919 Feb. 6, 1919 Mar. 6, 1919 Mar. 13, 1919 April 17, 1919 Mar. 27, 1919	\$20,199 42	Mar. 13, 1919

WORK CONTRACTED FOR AND COMPLETED WITHIN BIENNIAL PERIOD 1918-1920—Continued.

No.	Date of contract	Description	Contractors	Contract price	Payments	Date of payments	Total	Date of completion
318	Jan. 23, 1919	Furnishing materials and constructing bulkhead wharf, building for Pier No. 41.	J. D. Hannah-----	\$31,400 00 (Extras) 235 56 (Extras) 788 05	\$3,532 50 3,768 00 5,652 00 3,532 50 5,887 50 1,177 50 7,850 00 235 56 788 05	May 1, 1919 June 5, 1919 July 3, 1919 Aug. 7, 1919 Sept. 4, 1919 Sept. 18, 1919 Oct. 23, 1919 Oct. 23, 1919 Nov. 28, 1919	\$32,423 61	Sept. 18, 1919
320	Feb. 27, 1919	Paving portion of Embarcadero in front of Pier No. 3.	Fay Improvement Co.---	Bituminous pavement 2½" thick on 6" concrete base @ .224 per square f o t. Concrete pavement 2½" thick on special base @ .12 per sq. ft.	\$6,981 34 *350 00 433 17 48 89 2,327 11	May 1, 1919 May 1, 1919 May 1, 1919 May 15, 1919 June 5, 1919	\$9,700 51	May 1, 1919
321	Mar. 18, 1919	Furnishing and installing steel rolling floors, Pier No. 31 shed, and connecting building for Piers Nos. 29 and 31.	C. Jorgensen -----	\$24,650 00 (Extras) 592 48	\$4,008 44 10,034 06 6,162 50 592 48	Dec. 18, 1919 Jan. 22, 1920 Mar. 4, 1920 Jan. 29, 1920	\$25,242 48	Jan. 22, 1920
				Deducted on account of delay 2,445 00			2,445 00	
				\$25,242 48			\$22,797 48	

322	April 4, 1919	Furnishing materials and constructing fish packing house and market, foot of Leavenworth street.	Frank B. Feake-----	\$10,733 00 (Extras) 880 30 Extras ----- \$11,663 30	\$5,661 07 2,429 18 2,695 75 102 00 753 00 25 30	May 1, 1919 June 5, 1919 July 10, 1919 June 5, 1919 June 5, 1919 June 5, 1919	\$11,663 30	June 5, 1919
323	Mar. 20, 1919	Bituminous pavement on concrete deck of Pier No. 31.	Clark & Henery-----	3" bituminous concrete @ \$0.125 per sq. ft. 2 3/4" bituminous concrete @ \$0.113 per sq. ft. 2" binder @ \$0.095 per sq. ft. 2" Toleka @ \$0.063 per sq. ft.	\$9,868 51 3,289 51 (Bonus) 75 00	May 29, 1919 July 3, 1919 July 3, 1919	\$13,233 02	May 29, 1919
324	Mar. 20, 1919	Furnishing materials and constructing addition to Pier No. 43.	J. D. Hannah-----	\$38,437 00 (Extras) 45 89 (Extras) 130 22 Extras ----- \$38,613 11	\$7,206 94 4,612 44 8,390 04 5,765 55 2,300 22 576 56 9,009 25 45 89 130 22	May 1, 1919 June 5, 1919 July 3, 1919 Aug. 7, 1919 Sept. 4, 1919 Sept. 18, 1919 Oct. 23, 1919 Aug. 23, 1919 Nov. 28, 1919	\$38,613 11	Sept. 13, 1919
325	May 16, 1919	Furnishing and installing steel rolling doors, Pier No. 33 shed and bulkhead wharf building.	Waterhouse-Wilcox Co.-	\$19,750 00 Extras ----- \$19,750 00	\$7,500 00 2,888 75 3,703 12 740 63 4,937 50	Sept. 25, 1919 Nov. 6, 1919 Dec. 4, 1919 Dec. 26, 1919 Jan. 29, 1920	\$19,750 00	Dec. 26, 1919

WORK CONTRACTED FOR AND COMPLETED WITHIN BIENNIAL PERIOD 1918-1920—Continued.

No.	Date of contract	Description	Contractors	Contract price	Payments	Date of payments	Total	Date of completion
326	June 6, 1919	Furnishing materials and constructing boat builder's shop, Fisherman's Wharf.	Frank E. Peake.....	\$6,373 00 (Extras) 159 29 Extra -----	\$3,584 81 1,194 04 1,593 25 159 29	July 3, 1919 Aug. 7, 1919 Sept. 11, 1919 Aug. 7, 1919	\$6,532 29	Aug. 7, 1919
327	June 10, 1919	Bituminous pavement on deck, Pier No. 33.	Pav Improvement Co....	3" bit. concrete @ \$0.123 per sq. ft. 2" Topeka pave. @ \$0.06 per sq. ft. 2" binder concrete @ \$0.084 per sq. ft.	\$7,968 03 *75 00 †149 55 2,666 01 *Bonus. †Extra.	Sept. 18, 1919 Sept. 18, 1919 Sept. 18, 1919 Oct. 23, 1919	\$10,883 59	Sept. 18, 1919
328	June 12, 1919	Furnishing and installing steel rolling doors in bulkhead wharf building, Pier No. 41.	Pacific Building Materials Co.	\$5,390 00	\$3,436 12 606 38 1,347 50	Dec. 4, 1919 Dec. 11, 1919 Jan. 15, 1920	\$5,390 00	Dec. 11, 1919
329	June 26, 1919	Concrete pavement at Vegetable Oil Plant, Islais street.	Clinton Construction Co.	\$5,390 00 \$9,489 00 (Extras) 492 66 Extra ----- Extra -----	\$7,116 75 2,372 25 300 00 192 66	Aug. 20, 1919 Sept. 25, 1919 Aug. 20, 1919 Aug. 23, 1919	\$9,981 66	Aug. 20, 1919
330	July 17, 1919	Furnishing materials and constructing market, Fisherman's Basin, foot of Leavenworth street.	Frank E. Peake.....	\$8,894 00 (Extras) 249 00 Extra -----	\$3,989 80 2,326 80 332 40 2,216 00 249 00	Aug. 7, 1919 Sept. 4, 1919 Sept. 11, 1919 Oct. 16, 1919 Sept. 11, 1919	\$9,113 00	Sept. 11, 1919

331	Aug. 8, 1919	Furnishing materials and construct- ing shed at Islais street and Arthur avenue.	A. P. Koch.....	(Extras)	\$27,840 00 869 81	\$2,091 75 6,275 25 6,693 60 5,856 90 6,972 50 145 00 323 40 401 41	Sept. 4, 1919 Oct. 2, 1919 Nov. 6, 1919 Dec. 4, 1919 Jan. 8, 1920 Dec. 4, 1919 Dec. 11, 1919 Feb. 13, 1920	\$28,759 81	Dec. 4, 1919
332	Aug. 14, 1919	Furnishing materials and construct- ing extension to Pier No. 25.	Clinton Construction Co.	(Extras)	\$50,106 00 536 13	\$15,783 39 4,585 33 13,162 83 3,457 95 12,896 50 508 33 27 80	Oct. 2, 1919 Nov. 6, 1919 Dec. 4, 1919 Dec. 26, 1919 Feb. 5, 1920 Nov. 6, 1919 Dec. 4, 1919	\$50,642 13	Dec. 26, 1919
335	Aug. 26, 1919	Paving portion of Embarcadero along Sections 2 and 3 of the sea- wall.	Blanchard, Crocker & Howell.	8" concrete base with seal wearing surface, \$0.1675 per sq. ft. Special grouted track with seal wearing surface, \$0.3775 per sq. ft.	\$2,638 12 4,017 27 1,035 52 2,563 64	Nov. 6, 1919 Dec. 4, 1919 Jan. 8, 1920 Feb. 13, 1920	\$10,254 55	Jan. 8, 1920	

WORK CONTRACTED FOR AND COMPLETED WITHIN BIENNIAL PERIOD 1918-1920—Concluded.

No.	Date of contract	Description	Contractors	Contract price	Payments	Date of payments	Total	Date of completion
336	Jan. 8, 1920	Furnishing materials and constructing timber depressed track along south side of Pier No. 5.	A. W. Kitchen & Co.---	\$13,970 00 (Extras) 312 28	\$1,047 75 5,657 85 3,671 90 3,492 50 100 00 312 28	April 8, 1920 May 6, 1920 May 27, 1920 July 1, 1920 July 29, 1920 June 3, 1920		
339	Mar. 27, 1920	Dredging Islais street channel 250 feet wide and 36 feet below city datum from 36' contour (referred to city datum) in San Francisco Bay to the line of Kentucky street in San Francisco.	San Francisco Bridge Co.	\$14,282 28 \$9.072 per cu. yard.	\$10,521 90 12,238 34 7,586 75	May 5, 1920 June 10, 1920 July 15, 1920	\$14,282 28	May 27, 1920
				Estimated at \$10,000 cubic yards.			\$30,346 99	June 10, 1920

WORK CONTRACTED FOR AND NOT COMPLETED WITHIN BIENNIAL PERIOD 1918-1920.

No.	Date of contract	Description	Contractors	Contract price	Payments	Date of payments	Total	Date of completion
337	Jan. 8, 1920	Furnishing materials and constructing bulkhead wharf in front of Pier 5, connecting existing bulkhead wharves at Piers 3 and 5.	Healy - Tibbitts Construction Co.	\$39,470 00	\$5,928 45 3,552 30 888 08 1,776 15	Mar. 4, 1920 April 8, 1920 May 5, 1920 June 3, 1920		
338	Feb. 27, 1920	Furnishing materials and constructing bulkhead wharf in front of Pier 27, connecting existing bulkhead wharves at Piers 25 and 29, and constructing creosote pile connecting wharf between Piers 25 and 27.	Healy - Tibbitts Construction Co.	\$38,717 00	\$6,067 03 871 13	April 8, 1920 June 3, 1920		
340	May 26, 1920	Furnishing materials and constructing extension to Pier 20.	Healy - Tibbitts Construction Co.	\$44,199 00				

PART VIII.

MATTERS OF GENERAL INFORMATION.



DESCRIPTION OF SAN FRANCISCO HARBOR.

Entrance.

The Golden Gate is the entrance which connects the bay of San Francisco and tributary rivers with the Pacific Ocean. It is about three miles in length, nearly a mile wide at its narrowest part, and has a minimum depth of 105 feet.

Its shores are high, bold and rocky. Outside the entrance, about six miles distant is the "bar," a crescent shaped sand bank with a minimum depth of 24 feet at low water, extending from the Bonita Channel on the north to the south channel, about six miles below Point Lobos. Three deep natural channels cut this "bar."

The Bonita, or North Channel, has a width of over 2000 feet at its narrowest point and a minimum depth at mean low water of 54 feet. A second channel known as the Central or Main Ship Channel crosses the "bar" about the center of the crescent and is over a mile in width with a minimum depth of 35 feet at mean low water. The third, or South Channel, follows close to the San Francisco shore line. It is two-thirds of a mile wide and has a minimum depth of 36 feet at mean low water.

It is a satisfaction to San Francisco to know that no matter how great the depth of the ship of the future, it will always be able to enter this port in safety. Very few of the ports of the world can boast of such deep wide channels at their entrance.

The United States Coast and Geodetic Survey gives the mean tidal range at entrance to San Francisco Bay at 3.9 feet or 5.59 feet if the mean higher high and the mean lower low are compared.

Inside the Port.

Here nature has supplied a deep, safe, commodious waterway. San Francisco Bay, if we include its northern extension, San Pablo Bay, covers an area of 420 square miles, or excluding the areas of submerged lands under private ownership, 291 square miles. It is one of the very largest land-locked harbors in the world, and so safe that the annual damage to shipping is practically nil.

Extending from the south portal of the Golden Gate at Fort Point, along the bay shore of San Francisco and San Mateo counties, thence across Santa Clara to Alameda County and following along the shores of Contra Costa, Solano, Sonoma and Marin counties to Lime Point, we have, omitting the numerous navigable inlets, a shore line 155 miles in length, every mile of which is suitable and available for commercial and industrial use.

Along the San Francisco waterfront, at the pier head line, the depth of water ranges from 40 feet to 80 feet. The only dredging required is in the slips between the piers in the basins and inlets, where a depth of 20 to 40 feet is maintained. The state operates one clam shell dredger which cares for all necessary dredging.

San Francisco is the terminal point of four great transcontinental railroad systems, and has behind it and directly tributary to it the two immense valleys of the Sacramento and San Joaquin rivers, which drain more than half the productive area of the extensive State of California.

Likewise the coast railway lines north and south of San Francisco are intimately connected with the harbor by important transportation systems, steadily ramifying into much new territory.

PROPERTY UNDER JURISDICTION OF BOARD OF STATE HARBOR COMMISSIONERS.

Commencing at the point where the easterly line of the Presidio reservation intersects the waterfront line as established by the Board of State Tide Land Commissioners; thence easterly along said waterfront line parallel with and distant two hundred feet northerly from the northerly line of Lewis street to the center of Webster street; thence southerly along the center of Webster street to the center of Lewis street; thence easterly along the center of Lewis street to the southwesterly line of The Embarcadero at the easterly line of Van Ness avenue; thence along said line of The Embarcadero to the center of Polk street; thence southerly along the center of Polk street to the center of Tonquin street; thence easterly along the center of Tonquin street to the center of Larkin street; thence southerly along the center of Larkin street to the center of Jefferson street; thence easterly along the center of Jefferson street to the southwesterly line of The Embarcadero; thence along said line of The Embarcadero to the center of Powell street; thence southerly along the center of Powell street to the center of Beach street; thence easterly along the center of Beach street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Grant avenue; thence southerly along the center of Grant avenue to the center of North Point street; thence easterly along the center of North Point street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Kearny street; thence southerly along the center of Kearny street to the center of Francisco street; thence easterly along the center of Francisco street to the center of Montgomery street; thence southerly along the center of Montgomery street to the center of Chestnut street; thence easterly along the center of Chestnut street to the center of

Sansome street; thence southerly along the center of Sansome street to the center of Lombard street; thence easterly along the center of Lombard street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Battery street; thence southerly along the center of Battery street to the center of Greenwich street; thence easterly along the center of Greenwich street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Front street; thence southerly along the center of Front street to the center of Vallejo street; thence easterly along the center of Vallejo street to the center of Davis street; thence southerly along the center of Davis street to the center of Pacific street; thence easterly along the center of Pacific street to the westerly line of The Embarcadero; thence southerly along the westerly line of The Embarcadero to the southerly line of Pacific street; thence along a line parallel with Drumm street and distant seventy-five feet six inches therefrom to the intersection of the westerly line of The Embarcadero with the northerly line of Jackson street; thence along the westerly line of The Embarcadero to the northerly line of Clay street; thence along the northerly line of Clay street to the westerly line of The Embarcadero; thence along the westerly line of The Embarcadero to a point on said line distant northerly along said line sixty feet four inches from the intersection of said line with the northerly line of Market street; thence southerly along a line forming a right angle with Sacramento street to the northerly line of Sacramento street; thence along the northerly line of Sacramento street to the northerly line of Market street; thence along the northerly line of Market street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Folsom street; thence westerly along the center of Folsom street to the center of Steuart street; thence southerly along the center of Steuart street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to its intersection with a line parallel with and distant one hundred thirty-seven feet six inches southerly from Harrison street; thence along said last described line to the center of Spear street; thence southerly along the center of Spear street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Bryant street; thence westerly along the center of Bryant street to the center of Beale street; thence southerly along the center of Beale street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Brannan street; thence westerly along the center of Brannan street to the center of First street; thence southerly along the center of First street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Townsend street; thence westerly along the center

of Townsend street to the center of Gale street; thence at right angles southerly along the center of Gale street to the center of King street; thence westerly along the center of King street to the center of Second street; thence southerly along the center of Second street to the center of Berry street; thence westerly along the center of Berry street to the center of Third street; thence southerly along the center of Third street to the northerly line of Channel street; thence westerly along the last mentioned line to a point on the shore line of 1851, five hundred eighty-eight feet more or less westerly from the westerly line of Seventh street; thence southerly along said shore line to the southerly line of said Channel street; thence easterly along said last mentioned line six hundred seventy-five feet more or less to the westerly line of Seventh street; thence continuing easterly along said southerly line of Channel street to the center of Third street; thence southerly along the center of Third street to the center of Fourth street; thence along the center of Fourth street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Louisiana street; thence southerly along the center of Louisiana street to the center of El Dorado street; thence westerly along the center of El Dorado street to the center of Illinois street; thence southerly along the center of Illinois street to the center of Eighteenth street; thence easterly along the center of Eighteenth street to the westerly line of The Embarcadero; thence southerly along the westerly line of The Embarcadero to the water front line established by the Board of State Tide Land Commissioners near its intersection with the southerly line of Twenty-second street; thence along said water front line to the westerly line of The Embarcadero at its intersection with the southerly line of Twenty-sixth street; thence along said line of The Embarcadero to the center of Tulare street; thence westerly along the center of Tulare street to the center of what was formerly Hernadotte street; thence along the center of Hernadotte street across Islais Creek Channel to the center of Islais street; thence easterly along the center of Islais street to the easterly line of Third street; thence southerly along the easterly line of Third street to the south-westerly line of what was formerly Arthur avenue; thence along said last described line to the center of India street; thence southerly and easterly along the center of said India street to the westerly line of The Embarcadero; thence along said last described line to the center of China street; thence westerly along the center of China street to the center of Custer avenue; thence southerly along the center of Custer avenue to the northerly line of the property of the California Dry Dock Company; thence easterly along said last mentioned line to the westerly line of The Embarcadero; thence along the westerly line

of The Embarcadero to the center of Waterfront street; thence south-westerly and southeasterly along the center of Waterfront street to the westerly line of The Embarcadero; thence along said line of The Embarcadero to the center of Shafter avenue; thence westerly along the center of Shafter avenue to the center of Alvord street; thence southerly along the center of Alvord street to the center of Wallace avenue; thence westerly along the center of Wallace avenue to the shore line of 1878 at a point two hundred forty feet more or less northerly from Hawes street; thence southerly along said shore line to the center of Yosemite avenue; thence easterly along the center of Yosemite avenue to the westerly line of The Embarcadero; thence southerly along the westerly line of The Embarcadero to the southerly boundary of the city and county of San Francisco; thence along the southerly, easterly and northerly boundary lines of said city and county to a point due north of the place of commencement and thence south to the place of commencement.

SEAWALL LOTS.

Property of Board of State Harbor Commissioners. (See Map.)

Number	Area in square feet	Appraised valuation
A	584	\$5,000 00
B	29,518	67,500 00
C	52,500	131,250 00
1	72,781	200,000 00
2	8,677	25,000 00
3	38,849	120,000 00
4	31,178	110,000 00
5	54,005	150,000 00
6	13,130	50,000 00
7	87,067	325,000 00
8	30,264	145,000 00
9	4,727	25,000 00
10	4,326	28,500 00
11	45,372	202,500 00
12	75,524	440,000 00
13	3,103	20,000 00
14	42,630	300,000 00
15	75,447	505,000 00
16	2,746	25,000 00
17	23,647	92,700 00
18	26,793	93,775 00
19	14,623	51,180 50
20	93,668	327,838 00
21	14,625	85,000 00
22	97,791	600,000 00
23	88,577	400,000 00
24	78,285	400,000 00
25	10,860	67,500 00

FORBIDDEN ANCHORAGE GROUNDS.

No. 1. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area described as follows:

Beginning at the northerly outer corner of Pier No. 11, San Francisco; thence running in a straight line to the most northwesterly point of Goat Island; thence following easterly along the northerly shore line of said island to the most northeasterly point thereof; thence easterly in a straight line to the westerly pier of the San Francisco-Oakland Terminal Railways on the east side of the bay; thence southerly, following the three-fathom contour to the Oakland Estuary light; thence in a straight line to the outer end of Pier No. 46, San Francisco; thence along the pierhead line to the place of beginning.

No. 2. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area described as follows:

Beginning at the most easterly point of Point Blunt on Angel Island running thence in a straight line through Blossom Rock buoy to the pierhead line at the outer end of Pier No. 3; thence following the pierhead line to its intersection with a line drawn from the northwest corner of the cannery of the California Packing Corporation, at North Beach, to the light on Alcatraz Island; thence along said line and continuing along a straight line from the light on Alcatraz Island to the light at Point Knox; thence following the southerly shore of Angel Island to the place of beginning.

No. 3. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area described as follows:

Beginning at the outer end of the Port Richmond ferry slip; running thence in a straight line toward the outer end of Pier No. 14, to an intersection with the pierhead line; thence along the pierhead line to a point in line with the northerly side of Pier No. 27; thence on a straight line through the buoy anchored at the southerly spit of Southampton Shoal to a point directly west of the westerly point of Point Richmond; thence east to the place of beginning.

No. 4. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area described as follows:

Beginning at the westerly end of the brick fort at Fort Point; running thence in a straight line to the northwest corner of the California Building at the Exposition Grounds; thence along the shore line to the place of beginning.

No. 5. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area described as follows:

Beginning at Yellow Bluff; running thence in a straight line to Point Knox; thence along the westerly shore of Angel Island to Point Stuart light; thence in a straight line running 241 degrees from Point Stuart light to the shore of Sausalito Cove; thence along the shore line to the place of beginning.

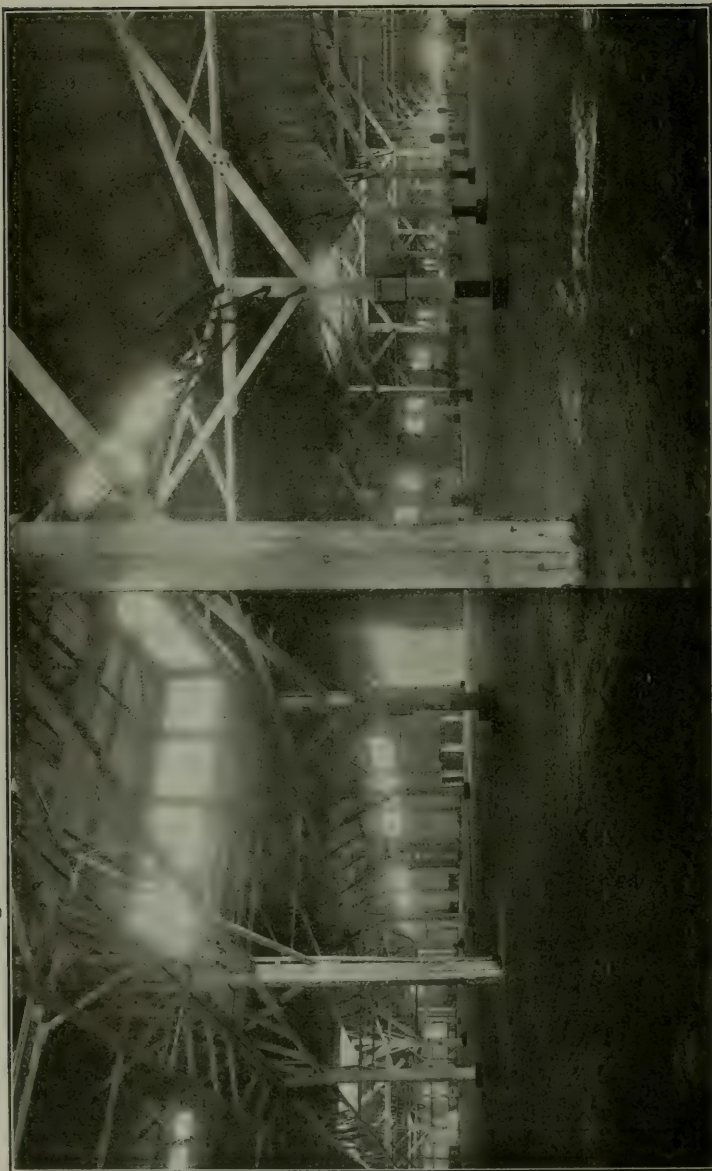
No. 6. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area described as follows:

Beginning at a point in Bonita Cove, one-half statute mile, in a northeasterly direction, from the Fort Barry wharf (which is the only wharf in Bonita Cove); running thence in a straight line toward the wireless tower, on the westerly side of the Presidio Reservation, to the shore of South Bay; thence along the shore line to a point one-half statute mile to the seaward of the large cable sign at Baker's Beach; thence in a straight line to Point Bonita light; thence along the shore line to the place of beginning.

No. 7. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area extending from the water front of the city and county of San Francisco to the mouth of Oakland Creek; bounded on the northerly side by a straight line drawn from the southeast corner of the Sugar House, Potrero Point, to the high tank on the Oakland Mole, and on the southerly side by a straight line running 219 degrees from the outer end of the Southern Pacific ferry slip at Alameda Mole to the water front of San Francisco.

No. 7½. Vessels must not be anchored, nor moored, nor when at anchor be allowed to swing within the area described as follows:

Beginning at the outer end of Pier No. 46, running thence in a straight line toward the Oakland Estuary light to the intersection with a line parallel to and 500 yards distant (measured at right angles) from the pierhead line of the city and county of San Francisco; thence along said line paralleling the pierhead line to a point east of the brick chimney at Point Avisadero; thence west to the pierhead line; thence along the pierhead line to the place of beginning.



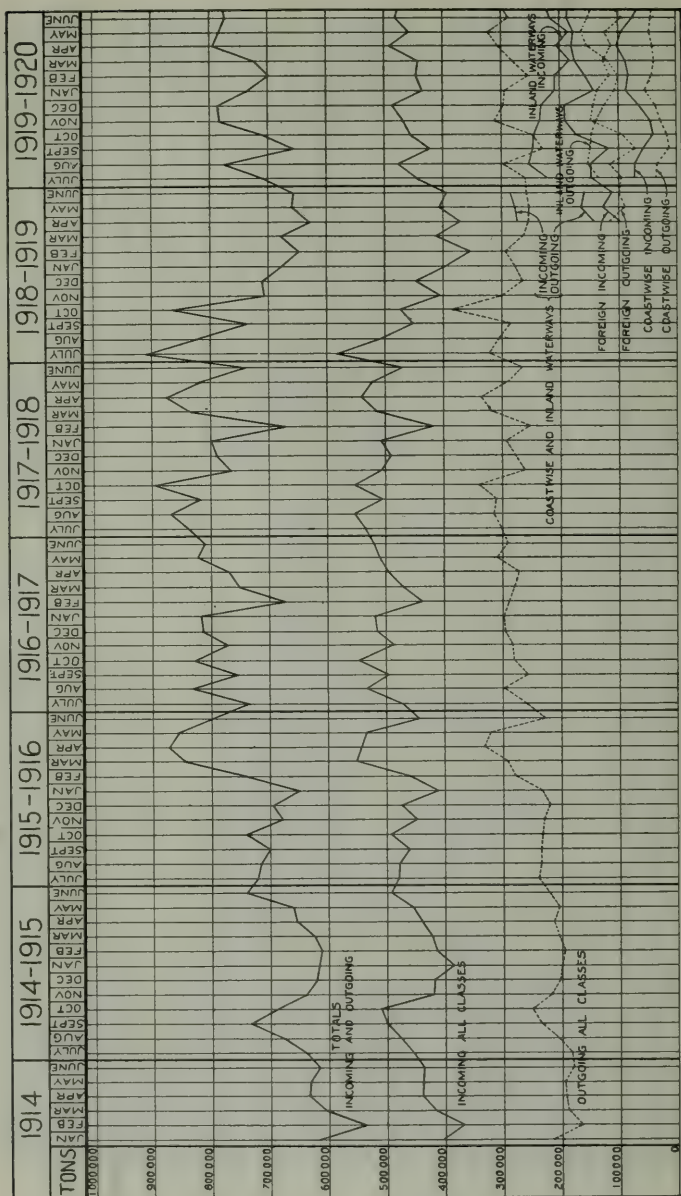
Connecting Bulkhead Between Piers 29 and 31—Supplies 8,800 Square Feet Additional Cargo-Handling Space.

HARBOR FACILITIES.

Port of San Francisco.

	Total June 30, 1920.
Pier and wharf area—	
Covered	77.0 acres
Uncovered	63.9 acres
Total	140.8 acres
Berthing space, exclusive of pier ends.....	15.4 miles
Car ferry slips.....	6
Passenger ferry slips.....	12
Number of vessels averaging 400 feet in length which can berth simultaneously...	207
Cargo capacity, based on 50 per cent of area—	
Covered	400,719 tons
Uncovered	203,870 tons
Total	604,589 tons
Vegetable oil bulk storage.....	15,450 tons
Belt Railroad mileage—	
Main line	9.58 miles
Pier and wharf tracks.....	13.96 miles
Yards and sidings.....	19.55 miles
Total	43.09 miles
Car capacity—	
Pier and wharf tracks.....	1,098 cars
Yards and sidings.....	1,696 cars
Total	2,794 cars

Yards under control of the railroad companies are not included in this statement.



COMPARATIVE DIAGRAM SHOWING TONNAGE HANDLED MONTHLY SINCE JAN., 1914

DRY DOCKS, MARINE RAILWAYS AND DERRICK FACILITIES IN SAN FRANCISCO BAY.

GRAVING DOCKS.

Hunter's Point.

Bethlehem Shipbuilding Corporation:

- No. 1. Length, 750 feet; width, top, 103 feet; bottom, 86 feet; depth over sill, 29 feet.
- No. 2. Length, 1,020 feet; width, top, 153 feet; bottom, 110 feet; depth over sill, 45 feet 6 inches.

FLOATING DRY DOCKS.

Bethlehem Shipbuilding Corporation:

- No. 2. Length, 271 feet; width, 66 feet; capacity, 3,000 tons.
- No. 3. Length, 301 feet; width, 68 feet; capacity, 2,500 tons.
- No. 4. Length, 430 feet; width, 80 feet; capacity, 6,500 tons.
- No. 5. Length, 421 feet; width, 90 feet; capacity, 12,000 tons.

Moore Shipbuilding Company:

- No. 1. Length, 462 feet; width, 100 feet; capacity, 15,600 tons.
- One nearly completed will take vessel 700 feet long by 80-foot beam.

MARINE RAILWAYS.

Bethlehem Shipbuilding Corporation:

- No. 1. Length, 320 feet; capacity 4,000 tons.
- No. 2. Length, 220 feet; capacity 2,000 tons.

Moore Shipbuilding Company:

- No. 1. Length, 380 feet; width, 70 feet; capacity, 8,000 tons.
Length of largest vessel taken, 450 feet.
- No. 2. Length, 442 feet; width, 76 feet; capacity, 8,000 tons.
Length of largest vessel taken, 510 feet.
- No. 3. Length, 360 feet; width, 76 feet; capacity, 5,400 tons.
Length of largest vessel taken, 430 feet.

Barnes and Tibbitts Shipbuilding and Dry Dock Company:

- No. 1. Length, 340 feet; width, 66 feet; capacity, 4,000 tons.
- No. 2. Length, 290 feet; width, 60 feet; capacity, 2,500 tons.

Hanlon Dry Dock and Shipbuilding Company:

- No. 1. Length, 308 feet; capacity, 4,000 tons.

SHEAR LEG DERRICKS.

Bethlehem Shipbuilding Corporation:

- 1 stationary, 80-ton capacity.
- 1 stationary, 50-ton capacity.
- 1 floating, 20-ton capacity.

Moore Shipbuilding Company:

- 1 stationary, 100-ton capacity.

Barnes and Tibbitts Shipbuilding and Dry Dock Company:

- 1 stationary, 40-ton capacity.

FLOATING BOOM DERRICKS.

Smith-Rice Company:

- 1 derrick, length of boom, 100 feet; lifting capacity, 75 tons.
- 1 derrick, length of boom, 100 feet; lifting capacity, 25 tons.
- 1 derrick, length of boom, 100 feet; lifting capacity, 20 tons.

Crowley Launch and Tugboat Company:

- 1 derrick, length of boom, 110 feet; lifting capacity, 75 tons.
- 2 derricks, length of boom, 100 feet; lifting capacity, 25 tons.
- 2 derricks, length of boom, 100 feet; lifting capacity, 8 tons.

Henry C. Peterson, Incorporated:

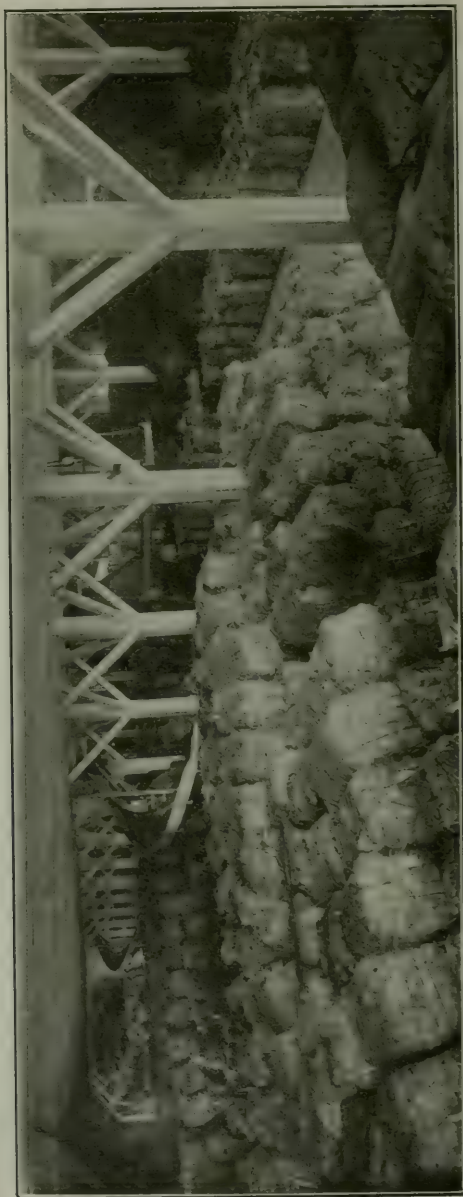
- 1 derrick, length of boom, 100 feet; lifting capacity, 7 tons.

Schaw-Batcher Company:

- 1 derrick, length of boom, 90 feet; lifting capacity, 16 tons.

Havside Company:

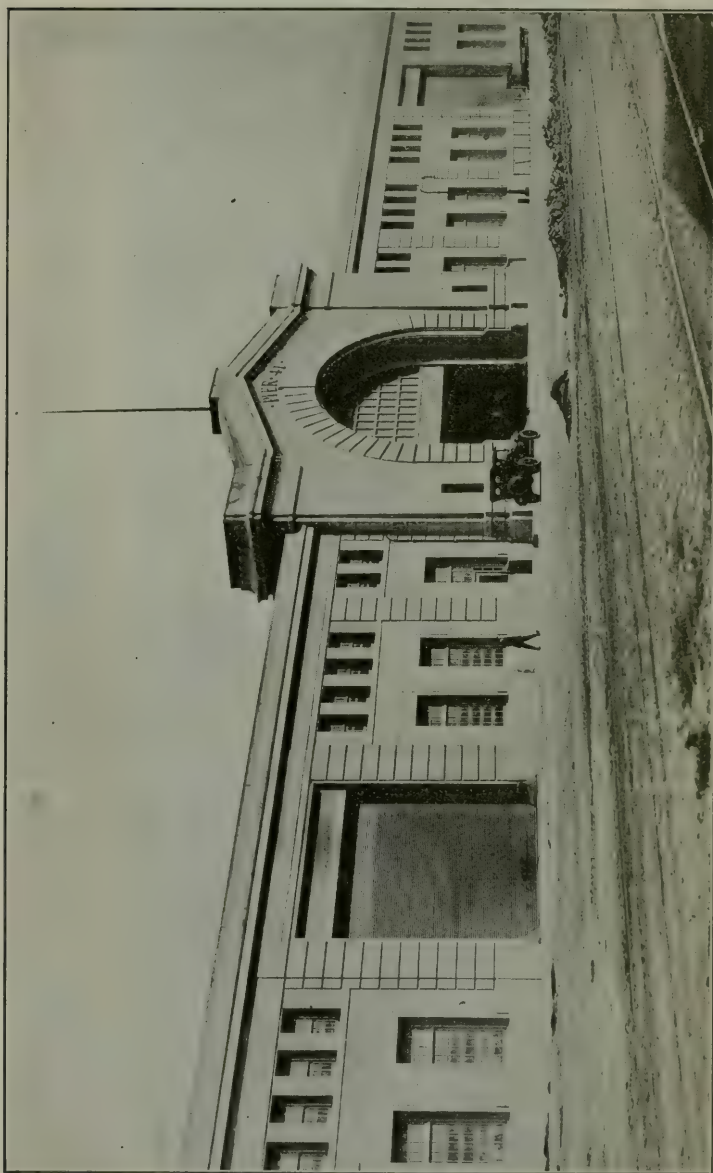
- 1 derrick, length of boom, 100 feet; lifting capacity, 50 tons.



San Francisco Imported Hemp and Other Fibrous Materials During the Fiscal Year, 45,09 Tons.

TONS OF FREIGHT DISCHARGED AND LOADED OVER THE STATE WHARVES
DURING THE TWENTY-SIX YEARS FROM 1894 TO 1920.

Year	Tons
1894-1895	3,729,367
1895-1896	3,848,461
1896-1897	3,657,219
1897-1898	3,894,362
1898-1899	4,154,543
1899-1900	4,646,157
1900-1901	5,048,831
1901-1902	4,890,679
1902-1903	5,203,485
1903-1904	5,525,048
1904-1905	5,292,113
1905-1906	5,748,902
1906-1907	6,502,793
1907-1908	6,468,527
1908-1909	6,325,078
1909-1910	6,866,148
1910-1911	6,629,122
1911-1912	6,798,726
1912-1913	7,523,965
1913-1914	7,253,806
1914-1915	7,947,117
1915-1916	8,900,255
1916-1917	9,389,417
United States transport wharves, Western Sugar Refinery wharves, and Bethlehem Shipbuilding Corporation wharves	465,142
	9,854,559
1917-1918	9,707,612
United States transport wharves, Western Sugar Refinery wharves, Bethlehem Shipbuilding Corporation wharves	550,000
	10,257,612
1918-1919	8,678,791
United States transport wharves, etc., etc.	519,678
	9,198,469
1919-1920	8,916,798
United States transport wharves, etc., etc.	650,000
	9,466,798
Total	165,940,232



Pier 41.—Pier Front Erected During Biennial Period.

CHARGES ASSESSED BY THE BOARD OF STATE HARBOR COMMISSIONERS.

The rules and regulations enforced by the Board of State Harbor Commissioners on property under their jurisdiction, as well as the charges assessed, are shown in the Board of State Harbor Commissioners' Tariff, which can be obtained at the office or by writing to the Board.

The following, however, shows briefly, without detail, the charges assessed. For complete information reference should be had to the Tariff.

In order to make clear the following tabulation, Coastwise trade is defined as trade along the Pacific Coast between Mexico and the Canadian border; inland waterway as trade or service between San Francisco and points located upon the bays, rivers and other inland waters of California; foreign and off-shore as all trans-Pacific trade and Atlantic seaboard trade.

	Definition	Rate	
		Foreign	Coastwise, etc.
Dockage:	*Charge assessed against vessel berthing at wharf.	None.	2 cents per ton first 200 net registered tonnage; 3 cent each additional ton.
Tolls:	Charge for cargo loaded or discharged on state wharves or in slips.	15 cents general.	5 cents general.
Wharf demurrage	**Charge for cargo delayed on state premises.	25 cents ton first five days. 50 cents ton each succeeding five days.	25 cents ton first five days. 50 cents ton each succeeding five days.
Belt Railroad switching:	Charge for switching loaded freight cars between any two points on the tracks of the Belt Railroad.	\$3.00 per car.	\$3.00 per car.

Rental charges will be assessed against steamship companies having sufficient business to require definite assignment of pier space on the basis of \$.012 coastwise or inland waterway, \$.006 foreign.

*Vessels engaged in foreign trade are not charged dockage. They are required, however, to load or discharge 500 tons per day, etc., in violation of which a penalty will be assessed against the vessel.

**Foreign cargo must be removed from the wharf within ten days after discharge of vessel; coastwise cargo within five days after discharge of vessel; thereafter penalties as shown accrue. Coastwise cargo may be assembled five days before arrival of vessel; foreign cargo may be assembled ten days before arrival of vessel.

SAN FRANCISCO PILOTAGE AND TOWAGE RATES.

Port of San Francisco; Charges, Regulations, etc.; not under jurisdiction of Board of State Harbor Commissioners.

PILOTAGE.

Jurisdiction: San Francisco Board of Pilot Commissioners, a state body composed of three members. Office of Commissioners, Merchants Exchange Building, San Francisco, Pilot Office, Pier 7, San Francisco.

Pilotage in and out of San Francisco harbor is under the jurisdiction of a State Board of Pilot Commissioners, appointed by the Governor, which body establishes the rules and regulations regarding the conduct of all pilots, as well as licensing and commissioning pilots.

Pilotage in and out of San Francisco Bay is generally compulsory, except as follows:

All vessels sailing under an enrollment, and licensed and engaged in the coasting trade between the Port of San Francisco and any other port of the United States are exempt from pilotage unless a pilot be actually employed.

All foreign vessels and all vessels from a foreign port or bound thereto, and all vessels sailing under a register between the Port of San Francisco and any other port of the United States are liable for pilotage.

While pilotage is compulsory it is stated on good authority as not necessary in most instances.

Rates of pilotage are fixed by state law as follows:

All vessels under 500 tons, \$2 per draught foot;

All vessels over 500 tons, \$2 per draught foot and 2 cents per ton for each and every ton registered measurement; and every vessel spoken inward and outward bound, except as hereinafter provided, shall pay the said rates.

A vessel is spoken by day by a pilot boat displaying a union jack, or by night displaying a torch or flare-up within a distance of three miles of the vessel. In all cases where inward bound vessels are not spoken until inside of the bar the rates of pilotage herein provided shall be reduced 50 per cent. Vessels engaged in the whaling or fishing trades shall be exempt from all pilotage except where a pilot is actually employed.

In the event a vessel not carrying cargo to the Port of San Francisco, nor seeking any thereat, is compelled to enter said port solely by reason of her being in distress or requiring repairs, provisions or fuel, the rates of pilotage into said harbor shall be as follows:

All vessels under 500 tons, \$1 per draught foot;

All vessels over 500 tons, \$1 per draught foot and 1 cent per ton for each and every ton registered measurement; and every vessel spoken inward bound shall pay the said rates. There shall be no reduction of rates of pilotage to vessels in distress where the vessel is spoken inside the bar. In the event that the vessel shall leave the Port of San Francisco without carrying any cargo therefrom, she shall pay the last-mentioned rates of pilotage out of the harbor of San Francisco.

SAN FRANCISCO PILOTAGE AND TOWAGE RATES.

Port of San Francisco; Charges, Regulations, etc.; not under jurisdiction of Board of State Harbor Commissioners.

TOWAGE.

Towage in San Francisco is conducted by private tow boat companies and the charges for the services performed vary according to the conditions under which the contract is to be carried out, but are generally assessed within the range of the following schedule:

Sailing Vessels.

The cost of towage from sea (lightship) to anchorage varies with distance and size of vessel ranging from \$100 to \$250.

For moving a vessel of 2000 tons net register in the harbor the charges are approximately:

Docking, city front.....	\$75 00
Stream to Port Costa or Port Costa to stream.....	175 00
Stream to sea (lightship).....	200 00

Fore and aft rigged vessels pay, according to size, from \$20 to \$30 for docking, and from \$50 to \$100 for towing to sea.

Steam and Motor Ships.

(Charges based on net tonnage vessel.)

1. Services to tug assisting to dock on city front.....	\$25 00 to	\$40 00
2. Towing (without power) from dock to dock between Meiggs (Fisherman's) Wharf to Mission Rock.....	75 00 to	150 00
3. Services to tug assisting Union Iron Works or Hunter's Point	50 00 to	70 00
4. Towing (without power) to Union Iron Works or Hunter's Point	100 00 to	225 00
5. Services to tug assisting to Oakland Harbor (East of Bridge at Webster street.....	50 00 to	80 00
6. Towing (without power) to Oakland Harbor.....	100 00 to	225 00

PORT WARDEN.

Port Warden. Appointed by Governor.

Fees: \$15 for each survey, but not to exceed \$75 on any vessel; rates on foreign vessels 50 per cent greater; separate certificate of surveys required by different consignees \$2.50 each; \$10 each order of sale.

WATER RATES NOW IN EFFECT IN THE PORT OF SAN FRANCISCO.

Gallons	Cubic feet	New rate
10,000	1,334	\$13 08
20,000	2,667	16 28
30,000	4,000	19 27
50,000	6,667	24 87
100,000	13,334	38 87
200,000	26,667	66 85

CHARGES, PORT OF SAN FRANCISCO, NOT ASSESSED BY BOARD OF STATE HARBOR COMMISSIONERS.

Stevedoring.

Stevedoring in the Port of San Francisco is contracted for by private individuals or firms. However, many steamship companies maintain their own organizations.

Competition in stevedoring is keen and rates are subject to change without notice; therefore, no figures are quoted herein.

It is the custom in the Port of San Francisco for the ship or steamship company to pay the cost of stevedoring or handling from the hold of the ship to the pile on the wharf (interior of the shed), and for the railway company to pay the stevedoring charges from the pile on the wharf to the car or vice versa on line hauls. On less than line hauls, and on local business, the consignee pays only the cost of unloading or loading cars or drayage charges.

UNITED STATES GOVERNMENT REGULATIONS, FEES AND OFFICIALS.

Port of San Francisco; charges, regulations, etc., not under jurisdiction of Board of State Harbor Commissioners.

CUSTOMS DISTRICT.

The Customs District of the Port of San Francisco comprises all that portion of the State of California north of the county of Santa Barbara.

Custom House, located at Washington and Battery Streets, San Francisco. Customs Officers: Collector of Customs, J. O. Davis and Henry E. Farmer; Surveyor of Customs, John S. Irby.

Customs Fees.

The ordinary entrance fees for vessels arriving from foreign ports with cargo are \$5.70 for foreign vessels and \$2.70 for American vessels.

The ordinary clearance fees for vessels going to foreign ports, either American or foreign vessels, are \$2.70.

Foreign vessels entering from a domestic port are charged a fee of \$2; likewise a fee of \$2 for clearing to a domestic port.

UNITED STATES INSPECTION OF STEAM VESSELS.

John K. Bulger, Custom House, Supervising Inspector.

Walter Macarthur, United States Shipping Commissioner; office, United States Appraisers Building.

UNITED STATES IMMIGRATION SERVICE.

Edward White, Commissioner; office, Angel Island and Barge Office, Fisherman's Wharf, San Francisco.

A fee of \$8 per head is charged for landing immigrant passengers. This fee is also charged for alien seamen discharged at this port.

UNITED STATES QUARANTINE SERVICE.

Dr. F. Simpson, Surgeon, United States Military Hospital Service, in charge; office, Angel Island and Barge Office, Fisherman's Wharf, San Francisco.

The federal government handles the entire matter of inspection, quarantine and fumigation in this port. Where fumigation is required the charge amounts to about thirteen cents per thousand cubic feet of air space fumigated plus one dollar for supervision and two dollars labor. This applies where the operation is conducted at the Angel Island Station, but in cases where vessels are fumigated on the San Francisco side the expenses of the fumigating officer amounting to hotel accommodations and incidental expenses are charged in addition to the above rate.

UNITED STATES LIGHTHOUSE ESTABLISHMENT.

H. W. Rhodes, Inspector; office, Customs House.

INTERNAL REVENUE DEPARTMENT.

Justus S. Wardell, Collector; office, Customs House.

UNITED STATES BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

Ellwood G. Babbitt, Commission Agent; Customs House.

UNITED STATES COAST GUARD SERVICE.

Revenue Cutter Division.

Jas. H. Brown, Customs House, in charge.

Life Saving Division.

Captain F. G. Dodge, Inspector.

COMPARISON OF FOREIGN TONNAGE—SAN FRANCISCO AND SEATTLE—FOR THE FISCAL YEAR JULY 1, 1919, TO JUNE 30, 1920.

EXPORTS					IMPORTS				
	SanFran- cisco	Seattle	Favor of SanFran- cisco	Favor of Seattle		SanFran- cisco	Seattle	Favor of SanFran- cisco	Favor of Seattle
Alaska	Bulk oil and gasoline	26,560	26,561	—	Coal	100	—	100	—
	Oil—Fuel, Lub. and Illum.	18,379	18,379	—	Fish	17,543	52,486	—	34,943
	Miscellaneous	27,666	176,944	149,278	Miscellaneous	1,142	61,354	—	60,212
Asia, all others		72,605	176,944	104,339		18,785	113,840	—	95,055
	Bulk oil and gasoline	47,598	—	47,598	Miscellaneous	105,405	55,738	49,639	—
	Miscellaneous	83,962	22,571	61,391		—	—	—	—
Canada		131,580	22,571	108,989		—	—	—	—
	Bulk oil and gasoline	87,754	—	87,754	Coal	10,864	86,811	—	78,947
	Oil—Fuel	68,873	4,316	64,557	Paper	12,477	10,562	1,925	—
Central America	Miscellaneous	38,824	91,765	52,931	Miscellaneous	22,250	201,814	—	179,564
		195,451	96,071	99,380		45,591	392,177	—	256,586
	Bulk oil and gasoline	21,602	—	21,602	Miscellaneous	239,525	—	239,525	—
Continental Europe	Miscellaneous	110,551	596	109,955		—	—	—	—
		132,153	596	131,557		—	—	—	—
	Bulk oil and gasoline	2,863	—	2,863	Miscellaneous	—	—	—	—
	Lumber	1,384	2,737	1,353		—	—	—	—
	Miscellaneous	30,408	11,750	18,658	Miscellaneous	5,298	46	5,164	—
		34,655	14,487	20,168		—	—	—	—

COMPARISON OF FOREIGN TONNAGE—SAN FRANCISCO AND SEATTLE—Continued.

	EXPORTS				IMPORTS			
	Miscellaneous	58,447	1,810	56,637	Miscellaneous	70,278	11,783	58,495
East Indies								
Philippines	Bulk oil	39,094		39,094	Fibres	28,672	20,263	8,409
	Miscellaneous	87,497	28,173	59,324	Miscellaneous	150,496	7,883	142,613
South America		126,591	28,173	98,418		179,168	28,146	151,022
	Miscellaneous	52,176	16,239	35,937	Miscellaneous	85,450	414	85,036
United Kingdom	Bulk oil	24,341		24,341	Vegetable oil	10,283		10,283
	Miscellaneous	130,222	17,013	113,209	Miscellaneous	17,708	1,973	15,735
		154,563	17,013	137,550		27,991	1,973	26,018
	Grand total	2,356,705	1,149,834	1,206,871	Grand total	1,737,432	889,792	847,640
NOTE.—Figures are net weights in tons of 2000 pounds.					Grand total of all exports and imports	4,094,137	2,039,626	2,054,511

EXPORTS, PORT OF SAN FRANCISCO, FOR THE FISCAL YEAR JULY 1, 1919, TO JUNE 30, 1920.

	Total	Alaska	Asia, all others	Canada	Central America	China, Chosen and Hongkong	Continent of Europe	Cuba	East Indies	Egypt	Hawaiian Islands	Japan	Oceania	Puerto Rico and Islands	Santo Domingo and Countries	South America	United Kingdom
Asphalt	21,111		1,426	1,874	51	6,067		1,127			4,512	1,471	2,058	1,114		41	427
Autos, at 30.0 lbs. per vehicle	9,121		1,675	20	92	582	0	814			2,563	566	643	1,251	14		9
Auto supplies	1,683		2	233	2	1,683					52	144	56	112			5
Bread and foodstuffs	16,362	455	248	19	329	547					9,044	414	691	94	21	2	10,019
Canned goods (10 lbs. per case)	2,567	159	242	77	45	121		22	212		76	169	429	1		4	244
Canned goods (5 lbs. per case)	44,656	141				10,214	27				10,009	1,009	1,009	2,300		293	
Chemicals, drugs, dyes and medicines	66,656	169				1,797	1,803	3,371			4,186	5,129	1,707	841		1,200	
Coal and coke	30,027	11,041				73	889				16,055	5,129	1,707	841		1,200	
Cordage and twine	1,597	35				45					1,552	45				50	
Cotton, manufactured	4,742	42				13					4,687	55				50	
Cotton, raw	39,182		50			7	618				38,514	25					
Dairy products	7,791	233	794	19	279	646	58	2			1,112	409	11	1,094	8	105	41
Elastics	2,712	19				1	192				2,509	193					
Fertilizer	81,774			856	2,517	241					45,464	307	149	149		15	
Fibres, manufactured	2,490	75	2	7	1,522	3					409	210	163	1		20	
Firebrick, tile and clay	8,864			106	147	1,130		1,130			6,246	106	28			20	
Fish, cods, per case	24,016	49	2,193	11	1,203	74	2	1,021			743	2,79	5,084	31		20	21
Flour	22,044	81	50	10	16,774	1,590		2,019	7,595		1,019	1,019	905	905		2,752	9,044
Fruit, canned (10 lbs. per case)	41,312	258	1,258	1,123	235	546	1,114	1,072	1,072		1,072	1,072	1,072	1,072		214	28,563
Fruit, fresh and dried	1,000			6,079	13	402					1,000	1,000	1,000	1,000		214	28,563
Glass and manufactures	2,823	19	4		42	269	13				2,530	283				109	
Hay, feed, etc.	1,097	68		1	178	11					2,281	11	45	1,000		42	
Iron and steel	14,489	20		97	74	1,329	1				12,107	1,107	1,107	1,107		1,107	
Iron and steel manufactures, miscellaneous	12,825	3	372	129	71	1,087					1,087	1,087	1,087	1,087		1,107	
Nails	5,621	97	53		173	1,520					1,107	1,107	1,107	1,107		1,107	
Pipe and fittings	14,932	152	414	6	221	813					1,107	1,107	1,107	1,107		1,107	
Railroad track material	1,789										1,789	1,789	1,789	1,789		1,107	
Shingles	34,812	2,043	51	45	2,175	1,107					1,107	1,107	1,107	1,107		1,107	
Shoes and manufactures	10,684	231	11	289	148	218					1,107	1,107	1,107	1,107		1,107	
Sugar	3,412	0									3,412	3,412	3,412	3,412		1,107	
Leather	3,894	10	29	64	20	24					3,894	3,894	3,894	3,894		1,107	51
Lumber	16,457	1,949	7,107	96	6,659		1,21	49			1,107	1,107	1,107	1,107		1,107	4,392
Manure	16,457	1,949	7,107	96	6,659		1,21	49			1,107	1,107	1,107	1,107		1,107	4,392
Mail	16,457	1,949	7,107	96	6,659		1,21	49			1,107	1,107	1,107	1,107		1,107	4,392
Meat and products	5,736	58	241	18	1,929	142	114	202	27		1,107	1,107	1,107	1,107		1,107	
Metals (all other)	1,000										1,000	1,000	1,000	1,000		1,107	
Miscellaneous	5,595	1,018	2,433	2,667	6,827	6,826		1,022			1,018	1,018	1,018	1,018		1,107	1,207
Oil—Fuel at 5 lbs. per gal.	172,411	0,185		22,407	40,898	7,592					1,107	1,107	1,107	1,107		1,107	
Gasoline, at 10 lbs. per gal.	9,222	11,012	17		30,559						1,107	1,107	1,107	1,107		1,107	
Gasoline, at 5 lbs. per gal.	11,012	1,012			11,012						1,107	1,107	1,107	1,107		1,107	
Lubricating and grease, at 7 lbs. per gal.	125,022	0	769	6,092	235	1,107		13	170		1,107	1,107	1,107	1,107		1,107	8,043
All others at 7 lbs. per gal.	10,198	58	573	24	1,691			309			1,107	1,107	1,107	1,107		1,107	
Paints	2,000			2,000							2,000	2,000	2,000	2,000		1,107	15
Paper	4,122	542	2,377	193	1,112	6,010		19	17	8,144	4,972	3,057				281	18
Paraffin	1,000										1,000	1,000	1,000	1,000		1,107	
Rice	7,595	136	5,494	1,502	2,879		1,772	25,517	9,390		9,043	2,887			30	5,302	8,343
Roads	4,441	111		93							1,107	1,107	1,107	1,107		1,107	
Rubber, manufactures	9,919	149	137	11	71	83					1,107	1,107	1,107	1,107		1,107	10
Silk	2,000	2,007	119	15,397	64	31					1,107	1,107	1,107	1,107		1,107	
Shoes	1,000			1,000							1,000	1,000	1,000	1,000		1,107	
Sugar	2,000	19	124	50	405	131					1,107	1,107	1,107	1,107		1,107	
Sugar	2,440	92		2	18	19					1,107	1,107	1,107	1,107		1,107	
Roads and manufactures	4,441										1,107	1,107	1,107	1,107		1,107	
Tobacco and manufactures	2,441	4	673	3							1,107	1,107	1,107	1,107		1,107	
Vegetables	20,024	623	220	595	2,000	446	1,441	9,538	37		5,812	4	876	73		1,107	
Wool, manufactures	13,000	237	131	10		68	1,441	9,538	37		5,812	4	876	73		1,107	
Wool, manufactures (all other)	6,000	230	1,283	180	440		1,283	1,283	440		1,283	1,283	1,283	1,283		1,107	
Zinc	3,580	16			186	15					1,107	1,107	1,107	1,107		1,107	
Sub total	1,808,738	40,445	30,255	107,407	110,551	272,341	31,792	40,568	58,447	8,240	397,571	391,202	114,802	87,407	95,467	52,170	130,225
Pork oil—Fuel	28,877	38,160		11,846	12,212	29,434					1,107	1,107	1,107	1,107		1,107	
Gasoline	135,022	6,449	10,577		3,800		4,268				1,107	1,107	1,107	1,107		1,107	
Illuminating	7,000			503		1,107					2,040			3,300			12,994
Lubricating and grease	12,811		8								1,107	1,107	1,107	1,107			30,977
Bulk oil total	487,052	54,769	31,315	12,751	21,022	127,438	2,963				35,492	45,019		30,091	13,253		21,912
Grand total	2,350,705	77,005	73,000	119,154	132,153	399,559	34,655	40,568	58,447	8,240	378,563	430,011	114,802	126,504	107,720	82,178	164,560

Note.—Figures are net weights in tons of 2,000 pounds.
(The bulk oil shipments have been separated only since December 1, 1919.)

IMPORTS, PORT OF SAN FRANCISCO, FOR THE FISCAL YEAR JULY 1, 1919, TO JUNE 30, 1920.

NOTE.—Figures are net weights in tons of 2,000 pounds.

BOARDS OF STATE HARBOR COMMISSIONERS

First Board—C. L. Taylor, appointed November 4, 1863; D. C. McRuer, appointed November 4, 1863; S. S. Tilton, appointed November 4, 1863.

Second Board—C. L. Taylor; S. S. Tilton; James Laidley, appointed November 6, 1865.

Third Board—S. S. Tilton; James Laidley; James H. Cutter, appointed November 4, 1865.

Fourth Board—James H. Cutter; John J. Marks, appointed December 6, 1869. Jasper O'Farrell, appointed January 15, 1870.

Fifth Board—John J. Marks; Jasper O'Farrell; Washington Bartlett, appointed June 23, 1870.

Sixth Board—John J. Marks; Jasper O'Farrell; John Rosenfeld, appointed November 29, 1871.

Seventh Board—John Rosenfeld; Jasper O'Farrell; Lewis Cunningham, appointed March 1, 1873.

Eighth Board—Lewis Cunningham; John Rosenfeld; Samuel Soule, appointed March 13, 1873.

Ninth Board—Lewis Cunningham; Samuel Soule; T. D. Mathewson, June 5, 1873.

Tenth Board—Samuel Soule; T. D. Mathewson; D. C. McRuer, appointed April 21, 1874.

Eleventh Board—Wm. Blanding, appointed March 4, 1876; Bruce B. Lee, appointed March 4, 1876; A. M. Burns, appointed March 4, 1876. Frank McCoppin succeeded Burns October 28, 1879.

Twelfth Board—Wm. Blanding; G. S. Evans, appointed January 27, 1880; Wm. A. Phillips, appointed March 4, 1880.

Thirteenth Board—Wm. Blanding; Wm. H. Knight, appointed November 23, 1882; Geo. S. Evans; Wm. A. Phillips.

Fourteenth Board—Wm. Irwin, appointed March 20, 1883, died March 1, 1886. A. C. Paulsell, appointed March 20, 1883; John H. Wise, appointed March 20, 1883.

Fifteenth Board—Frank McCoppin, appointed April 1, 1886; A. C. Paulsell; John H. Wise.

Sixteenth Board—William D. English, appointed March 13, 1887; A. C. Paulsell; John H. Wise.

Seventeenth Board—William D. English; A. C. Paulsell; Charles O. Alexander, appointed March 13, 1889.

Eighteenth Board—William D. English; Charles O. Alexander; William H. Brown, appointed March 13, 1890.

Nineteenth Board—C. F. Bassett, appointed March 31, 1891, Charles O. Alexander; William H. Brown.

Twentieth Board—C. F. Bassett; William H. Brown; Dan T. Cole, appointed March 13, 1893.

Twenty-first Board—C. F. Bassett; Dan T. Cole; F. S. Chadbourne, appointed March 13, 1894.

Twenty-second Board—E. L. Colnon, appointed March 14, 1894; Dan T. Cole; F. S. Chadbourne.

Twenty-third Board—E. L. Colnon; F. S. Chadbourne; P. J. Harney, appointed March 20, 1897.

Twenty-fourth Board—E. L. Colnon; P. J. Harney; Rudolph Herold, Jr., appointed March 13, 1898.

Twenty-fifth Board—Paris Kilburn, appointed March 14, 1899; P. J. Harney; Rudolph Herold, Jr.

Twenty-sixth Board—Chas. H. Spear, appointed March 16, 1903; John C. Kirkpatrick; John D. Mackenzie.

Twenty-seventh Board—W. V. Stafford, appointed March 19, 1907; Henry J. Crocker; W. E. Dennison.

Twenty-eighth Board—W. V. Stafford; W. E. Dennison; P. S. Teller, appointed April 1, 1909.

Twenty-ninth Board—W. V. Stafford; P. S. Teller; George M. Hill, appointed January 7, 1911.

Thirtieth Board—Marshall Hale, appointed March 26, 1911; George M. Hill, J. J. Dwyer, appointed March 26, 1911.

Thirty-first Board—J. J. Dwyer; George M. Hill, died July 10, 1912; Thomas S. Williams, appointed July 27, 1911.

Thirty-second Board—J. J. Dwyer; Thomas S. Williams; John H. McCallum, appointed July 30, 1912.

Thirty-third Board—Arthur Arlett, appointed February 15, 1917; Thomas S. Williams; John H. McCallum.

Thirty-fourth Board—Arthur Arlett; John H. McCallum; Harry H. Cosgriff, appointed June 6, 1918.

Thirty-fifth Board—John H. McCallum; Harry H. Cosgriff; Miles Standish, appointed December 6, 1918.

Thirty-sixth Board—John H. McCallum; Harry H. Cosgriff; Frederick S. Moody, appointed March 1, 1920.

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